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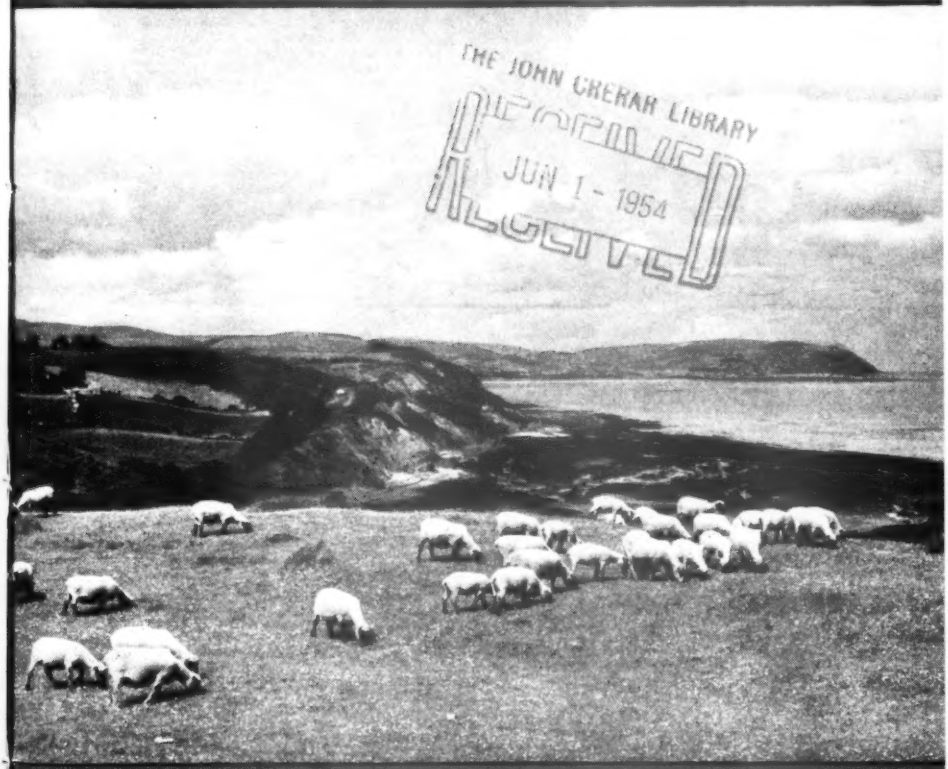

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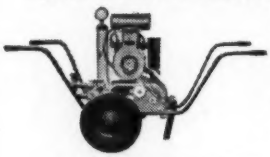

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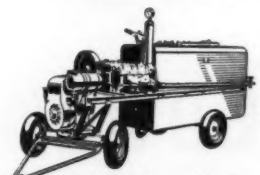

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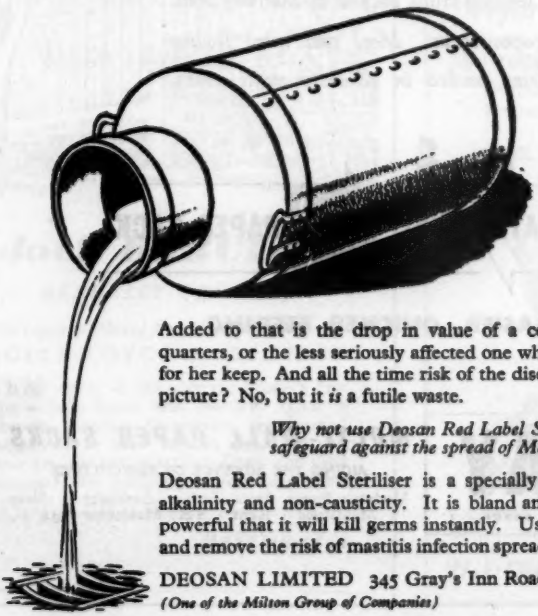

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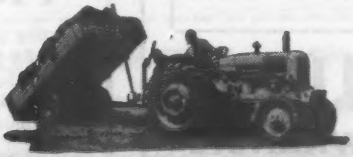

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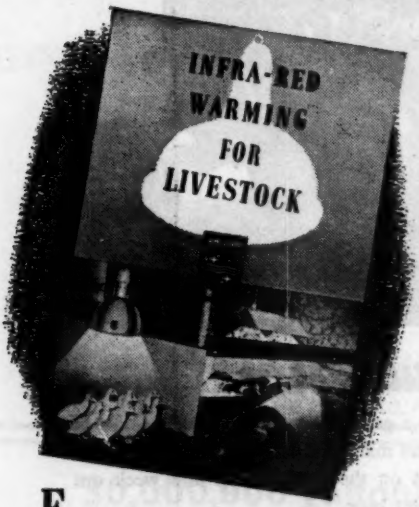

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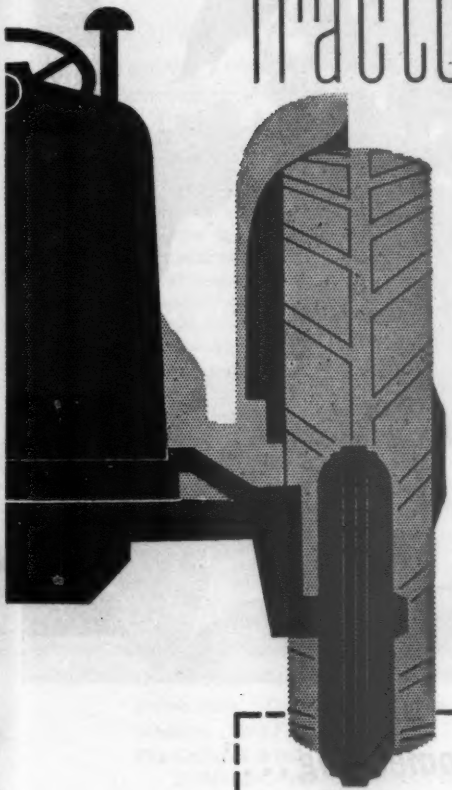

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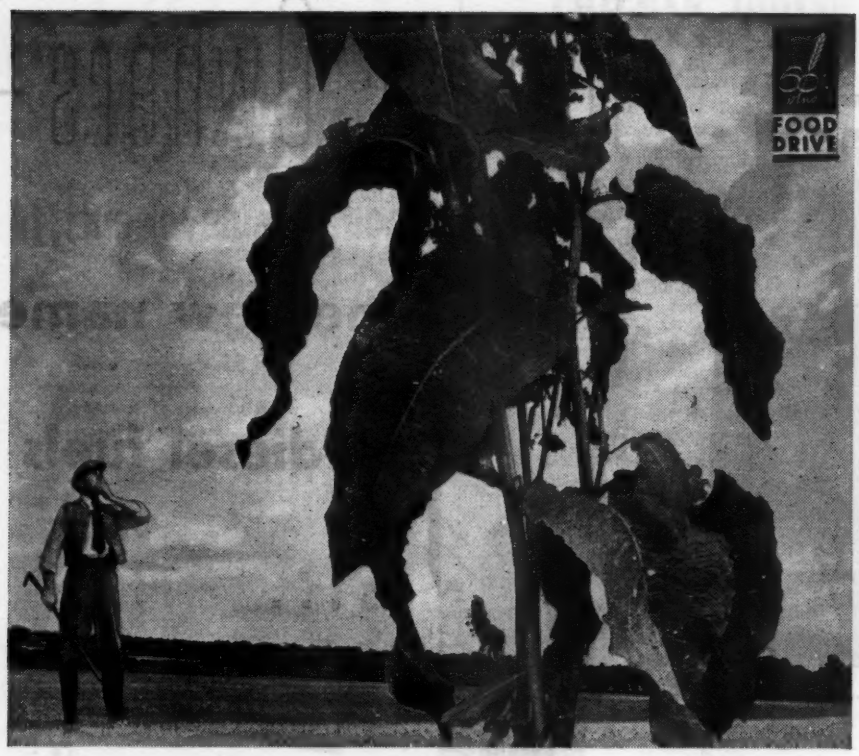

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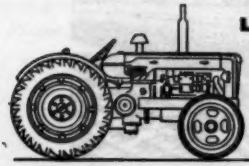

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VOL. LXI No. 2 MAY 1954

PASTURE MANAGEMENT TO CONTROL WORMS IN SHEEP

C. R. W. SPEDDING, M.Sc.

Grassland Research Station, Stratford-on-Avon

Experiments at the Grassland Research Station suggest that a much better control of stomach and intestinal worms in sheep than has hitherto been thought possible can be achieved by skilful pasture management.

WORMS in the alimentary tract of sheep cause considerable loss to the farmer, and their control has accordingly received a great deal of attention: (a) by dosing with anthelmintics, (b) by stimulating an acquired resistance, and (c) by management. The first method has received fresh impetus due to the better understanding of the properties of phenothiazine, the value of which as a preventive drug has been well illustrated by the work of Leiper (1). The second method of control has been suggested by Stewart (2), and depends upon the deliberate pre-infestation of lambs to stimulate an acquired resistance which protects the animals from subsequent heavy infestation. The third course involves variations of a rotational grazing management designed to prevent the sheep from grazing heavily contaminated pasture.

All these methods may be described as constituting a partial control, and each allows the presence of a low level of infestation. Recent research, however, has shown that even at very low, sub-clinical levels of infestation the performance and well-being of sheep is affected (3, 4, 5).

The methods of partial control, while aimed at keeping the level of infestation down, do not therefore eliminate all adverse effects, nor do they preclude the possibility of an outbreak of disease. Ultimately, even more efficient anthelmintics may be produced, capable of eliminating the whole range of species which constitute the worm burden of a sheep. At present, however, complete control must depend upon management, and experiments in progress at the Grassland Research Station indicate that control by grazing management has not yet been completely explored.

The usual conception of rotational grazing is to rest a pasture from grazing sufficiently long for environmental factors to have reduced the infective larval population before grazing it again. But the basis of complete control by management is the prevention of reinfestation altogether, and this can be achieved only by the use of a completely worm-free pasture. Such a pasture must be one that has carried no sheep or cattle for some two years. The exact length of this period is not known, and it may well be less than two years. To be of any practical importance, such a rest period must, of course,

fit in with normal farming practice, such as cutting for silage or hay. As a first step, therefore, a new ley appears to be the answer. It is quite practicable to sow down a ley on land that has not carried sheep for two years. Given a worm-free pasture, subsequent management depends upon the worm burden of the grazing anaimls. If completely worm-free stock were available, there would be no source of infection and management would not be important, as far as these parasites are concerned. The possibility of obtaining such stock is dealt with later in this article.

Strip Grazing to Prevent Reinfestation

At the present time, however, all grazing sheep carry worms. Fortunately, there is a gap of at least three days between the occurrence of worm eggs in the faeces and their development to an infective larval stage. Reinfestation can therefore be prevented by strip grazing or hurdling the sheep, moving to fresh ground every two days, and not returning to the grazed area in that season.

This method has been used at the Grassland Research Station and appeared to be successful. Eleven pairs of Clun Forest twin sheep were raised in indoor pens until weaned at four months old. They carried a negligible number of worms, judged by their average egg count of less than 20 eggs per gramme. They were separated into two groups (A and B), with one member of each twin pair in each group, and one group (B) was put out for 3½ days on a pasture regularly grazed by sheep. Both groups were then strip-grazed side by side, using wire netting fences with iron posts, across a new ley not previously grazed. The subsequent egg counts of these lambs are shown in Fig. 1. They indicate that no reinfestation occurred in Group A, in spite of their proximity to the infected animals. The egg counts of Group B provide

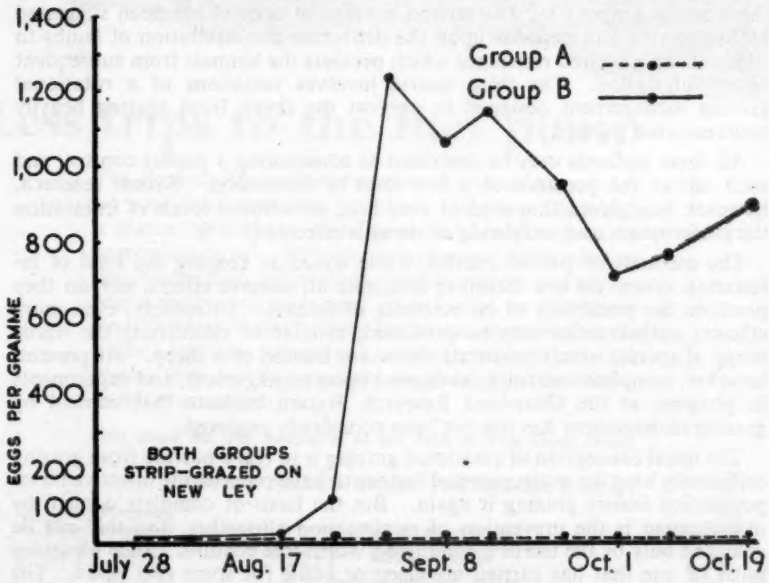

Fig. 1. Egg counts of groups A and B

an interesting comparison. Since the faeces of Group A were not completely devoid of eggs, it seems probable that not only was the pasture worm-free, but also that there was no reinfestation by the animals themselves. The level of egg output in Group B, therefore, must have been almost entirely attributable to their previous 3½ days grazing on a normal sheep pasture.

In the experiment described the ley was sown as a direct seeding following a corn crop which had been grazed in the stubble during the previous September. Since the ley was first grazed on August 4, 1953, and from experience proved to be completely worm-free, it seems likely that, under such treatment, a rest of eleven months may be sufficient to produce a clean pasture.

The strip-grazing method across clean pasture clearly prevents reinfestation and thus stabilizes the already established infestation in the sheep. Work is in progress to determine how long this procedure must be continued, with and without anthelmintic dosing, for the existing infestation in sheep to die out. In this way, management alone is capable of producing completely worm-free sheep.

Raising Worm-free Sheep An extension of the method to the raising of lambs might achieve this state more rapidly, and a beginning was made in this direction during the spring of 1953. A group of twenty-two Clun ewes and their thirty-five lambs were strip-grazed from lambing until weaning time, when the lambs were four months old. Unfortunately, an ungrazed ley was not available, and pasture that had been rested over the winter from October 1952 to March 1953 was used. This was shown to be an insufficient rest, for the pasture proved to be infective in June when cut and fed to worm-free lambs raised in indoor pens. These lambs acquired a slight infestation as a result, as did those grazing the pasture. But even this system gave a useful degree of control (Fig. 2), when aided by feeding powdered phenothiazine with crushed oats during the first two months.

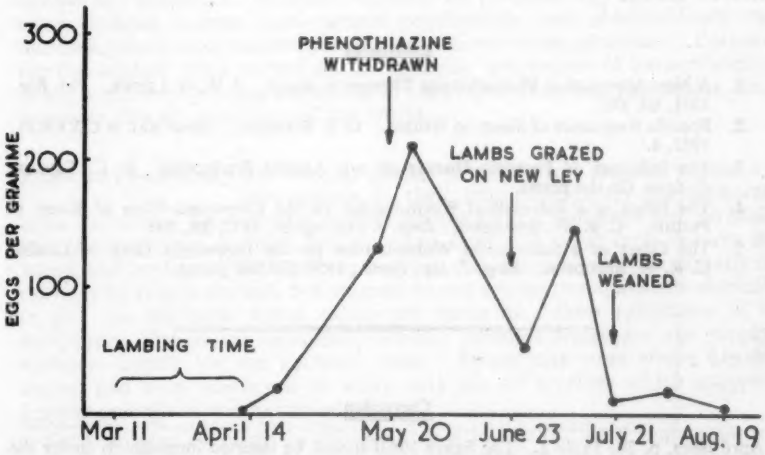

Fig. 2. Egg counts of lambs (Average of 35)

The most interesting feature of the experiment occurred when a new ley became available for grazing towards the end of June. The egg counts of both ewes and lambs dropped to extremely low levels shortly after the animals were moved on to this pasture, and at weaning time a number of ewes and lambs were passing faeces with negative egg counts. The average egg count for the thirty-five lambs at this time was 24 eggs per gramme, and for the ewes 25 eggs per gramme. It is intended to repeat this experiment on a new ley in the spring of 1954.

The implications of this work to sheep farming practice are that it should be possible, first, to raise worm-free lambs from infested ewes and, secondly, to obtain greater production from such lambs. It is also evident that complete control of worm infestation by management opens up the possibility of the eradication of these parasites from a flock.

The most direct route to such eradication is through the breeding unit. There are two ways of approaching this problem: ewe lambs may be retained from a worm-free lamb crop, or ewes may be strip-grazed across a clean pasture until they are worm-free. The former would probably take longer; the latter would be more troublesome. But once the breeding unit is worm-free, it could be grazed on a clean pasture and the strip-grazing management would be unnecessary.

The benefits of worm-free sheep are obvious and the dangers chiefly two. First, at times of pasture shortage it might be necessary to graze clean stock on contaminated land. (The problem of the age at which this could be done without incurring losses due to the lack of an acquired resistance in worm-free stock is at present under investigation.) Secondly, there is the danger of accidental infection. However, in the event of reinfestation occurring as the result of either of these difficulties, phenothiazine could be used to prevent a serious build-up.

In conclusion, it should be emphasized that completely worm-free sheep are a future possibility; but at present the full use of pasture management could achieve a far more complete control of worm infestation than has hitherto been thought possible.

References

1. A New Approach to Phenothiazine Therapy in Sheep. J. W. G. LEIPER. *Vet. Rec.*, 1951, **63**, 885.
2. Specific Resistance of Sheep to Worms. D. F. STEWART. *Rural Res. in C.S.I.R.O.*, 1953, 4.
3. The Influence of Parasitic Disease on our Animal Production. E. L. TAYLOR. *J. Agric.* (In the press).
4. The Effect of a Sub-clinical Worm-burden on the Liveweight Gain of Sheep at Pasture. C. R. W. SPEDDING. *Emp. J. exp. Agric.*, 1952, **20**, 209.
5. The Effect of a Sub-clinical Worm-burden on the Liveweight Gain of Lambs. C. R. W. SPEDDING. *Emp. J. exp. Agric.*, 1954. (In the press).

Correction

April issue, p. 20, Table 1. The figure 108.0 should be inserted immediately under the figure 95.2 in the column headed "Placed in Side Band".

TRACE ELEMENTS AND NUTRITION

1. MOLYBDENUM

G. DUNLOP, B.Sc. (AGRIC.), PH.D., N.D.A., N.D.D.

Quite small deficiences or excesses of trace minerals in the soil can have very serious effects on the nutrition of farm livestock and plant growth. In a series of three articles, Dr. Dunlop will discuss molybdenum, copper, and cobalt.

DURING the past thirty years, and perhaps more markedly since 1934, the practice of animal husbandry in every country in the world has profited greatly from the research of animal nutritionists. The requirements of animals for various essential nutrients are now known with some degree of accuracy, and many of their maladies have been shown to be nutritional in origin. Deficiencies or excesses of certain minerals and trace elements are now incriminated in the etiology of several diseases of farm livestock. In Britain it has been shown that most of the nutritional diseases appearing in horses and pigs result from rations fed while the animals are confined indoors. The deficient nutrient is usually either a mineral required by the animal in considerable amount—such as calcium or phosphorus—or one of the vitamins. In sheep, however, and frequently in cattle, the disorders occur while the animals are grazing on what are apparently good feeding pastures. In these cases, as would now appear from recent research work, the animals suffer from a nutritional deficiency of some essential trace element. Trace elements are minerals which occur in soils, plants and animals only in minute amounts, and it has been found that a number of these elements may be present in some pastures at a level too low to meet the nutritional requirements of the animal.

In 1934 it was reported by Hedley Marston at a meeting of nutrition research workers at the University of Adelaide that sheep require the trace element, cobalt, in their diet for normal health and production. In 1937, Dr. H. W. Bennetts at Perth in Western Australia demonstrated that a disease similar to "swayback" in lambs occurred on pastures very low in another trace element, copper, and normal productivity was obtained only by increasing the copper content of the ewes' rations during gestation. Following the original work carried out in Australia, deficiencies of trace elements in the pastures of grazing animals have been reported in every continent, and in practically all countries, of the world.

Effect on Productivity The various species of plants and animals appear to vary greatly in their requirements for the different trace elements. For example, pasture grasses and rye will grow well on land with a low copper content, but the same land will cause crop failures in wheat and barley. Various root crops in this country grow abnormally if boron is lacking in the soil, but animals do not appear to require this element at all. On the other hand, cattle and sheep may show symptoms of a debilitating disease on apparently healthy pastures which do not supply sufficient cobalt for the animals' needs. Sheep may pine where horses thrive, and even one breed of sheep may die on grazings which support healthy animals of another breed.

On a number of farms in this country it has been found impossible to maintain grazing animals in normal health and condition for long periods. Sooner or later, symptoms of some well-recognized disorder begin to appear

and the stock have to be moved to other pastures, sometimes miles away, if heavy losses are to be avoided. In the early volumes of the *Transactions of the Highland and Agricultural Society*, published at the end of the eighteenth century, there are articles by various farmers relating their experiences of setbacks and of nutritional diseases in their livestock. James Hogg was one of the first to provide detailed accounts of the appearance of "pining" on the border sheep grazings about 1790. He related his experiences in 1807 in *The Shepherds' Guide*.

Affected farms may occur singly in a district where other herds and flocks thrive all the year round. Alternatively, and as is most often the case, a number of such farms may be grouped together and extend over a whole parish, or even over a larger area. Such areas are found scattered over Great Britain, from John o'Groats to Land's End, and collectively they cover hundreds of square miles. The livestock which grazed on them for centuries have developed one syndrome or another and inflicted prolonged financial losses on their owners. Recently, however, certain methods of preventing and curing the syndromes have produced dramatic results when tried out on the grazings in those areas. Farms which have experienced heavy annual losses for decades are now, for the first time, able to maintain a full complement of healthy grazing stock which grow and fatten normally and breed well.

It would appear that with a wider knowledge of the present status of investigations into these diseases, many farmers will be able greatly to increase the productivity of their farms and help the research worker by recording their experiences. Hedley Marston, Chief of the Division of Biochemistry and General Nutrition of the Commonwealth Scientific and Industrial Research Organization at the University of Adelaide, South Australia, has recently summarized the state of our knowledge regarding a number of the trace elements which play a part in the nutrition of animals and plants by reviewing 838 scientific investigations which have been conducted mostly during the past twenty years.* Those aspects of the investigations concerning the practical nutrition of herds and flocks on British pastures and grazing land as regards molybdenum are summarized here for the benefit of livestock farmers in this country.

Molybdenum and the Teart Pastures Molybdenum is probably always present in living matter. Traces have been found in all animal and plant tissues adequately examined. Although molybdenum is now known to be necessary for plants and certain bacteria, there is as yet no evidence that animals require it. Interest in the behaviour of molybdenum in the rations of animals followed on observations in Somerset that cattle scoured excessively and developed symptoms of copper deficiency when confined to pastures which contained relatively large quantities of molybdenum. Although molybdenum is known to be necessary for the complete nutrition of micro-organisms and of the higher plants, its interest to stock-owners is concerned mainly with its influence on the copper metabolism of animals.

"Teartness" in cattle has been known for many years in certain parts of England, especially in the counties of Somerset, Gloucester, Warwick and Lincoln. As long ago as 1910 it was shown that molybdenum was associated with soils derived from geological rocks of the Lower Lias formation. The

* H. R. MARSTON. *Physiol. Rev.*, 1952, **32**, 66.

condition was later recognized to result from a high concentration of molybdenum in the pastures growing on these slightly alkaline, limestone soils. Sheep grazing on those pastures are found to be less affected than cattle and horses. The chief symptom of teartness is a most marked diarrhoea. Affected animals become thin and the colour of the coat fades. The observations that the severity of the condition is closely related to the molybdenum content of the pastures and that similar conditions can be induced in cattle kept inside by the administration of large doses of sodium molybdate indicated that excessive ingestion of molybdate was the cause of the disease.

The condition resembles that which develops in cattle grazing on reclaimed parts of the Zuyder Zee, where it was shown that dosing with copper successfully controlled the disease. This led to the realization that copper metabolism may be influenced by the ingestion of excessive quantities of molybdenum.

The immediate cause of the intense scouring is not yet understood. The disturbance of the bowel may be induced in some, but not in all, cattle by the addition of sodium molybdate to the normal ration. The quantity of molybdate that has to be administered in this way considerably exceeds that which is ingested in teart pastures. Teartness, however, may be controlled by dosing the animals with copper sulphate, while intravenous injection of much smaller quantities of copper sulphate have been reported to be equally effective.

A condition similar to teartness affects cattle grazing on pastures that have been reclaimed from peat land in New Zealand. There it is found that the amount of molybdenum in the pasture is high, although the copper content may be about normal. The grazing animals lose the copper in their bodies and develop signs of copper deficiency. Similar effects have been described in cattle on grazings in Florida and California. The evidence therefore suggests that teartness is an extreme manifestation of copper deficiency, although there is little justification for supposing that an excessive amount of molybdenum has invariably resulted in a condition of copper deficiency in animals. Nevertheless, the copper storage in the livers of sheep and cattle is greatly lessened by dosing the animals with molybdate.

Copper metabolism does seem to be affected by the presence of excess molybdenum in the diet, but there is no doubt that sheep may ingest large amounts of molybdate for long periods from the pasture on which they graze without showing any sign of copper deficiency, even though the amount of copper in their livers is greatly reduced.

Association with "Swayback" and Bone Disorders

The possible association of "swayback" with excess molybdenum has been pointed out. Long-term treatment of ewes with molybdate has been shown to decrease materially the quantity of copper normally present in the liver of the new-born lamb. Molybdate passes through the placenta very rapidly. It is found in the milk, which may explain the low copper content of the liver of lambs from ewes grazing on some "swayback" areas. However, attempts to produce "swayback" by administering large doses of molybdate to ewes for a considerable time before mating and through the gestation and suckling periods have not been successful.

Diets high in molybdenum are known to produce bone disorders in cattle and sheep. The variable occurrence of "bent-leg" and similar rachitic maladies in young sheep and cattle around New Year on various farms in

Scotland may yet be accounted for to some extent by the high concentration of molybdenum in the pastures on which they graze. The administration of a large dose of vitamin D is known to prevent and cure the rachitic condition of the young hill rams, but the variable incidence of the condition from grazing to grazing may be explained largely by the molybdenum content of the sheep's diet in winter.

To enable molybdenum to exert its limiting effect on the storage of copper in the liver of sheep, inorganic sulphate must also be present in the diet of the animal. Conditions under which copper deficiency in grazing animals occur depend, therefore, on both the inorganic sulphate and molybdenum contents of the pastures on which they graze. It has in fact been concluded, as the result of recent research work carried out at Victoria, Australia, that molybdenum analyses in animal metabolism work are valueless unless the inorganic sulphate in the diet is also taken into consideration.

Advantageous to Plant Life Attention was first directed to the nutritional importance of molybdenum in plants by the discovery in 1930 that certain moulds grow better when molybdenum is added to the nitrate in their growth medium. It is now clear that molybdenum is required by all nitrogen-fixing organisms. Small amounts of up to 8 oz. per acre of molybdenum, applied as sulphate to in-bye hill land, on which the grazing of animals is more concentrated than on the open hill, show that there is a marked response in the number of leguminous species present in the herbage. Experimental work has shown, in fact, that the number of leguminous (clover) plants established on the dressed portion may amount to ten times that present on the untreated grazings. The response to this small application of molybdenum is specially marked if phosphate, in the form of basic slag, has already been applied to the herbage, indicating that molybdenum exerts its action to the fullest extent when both phosphate and lime are present in the herbage. The increase in the proportion of leguminous plants resulting from an application of a few ounces of molybdenum sulphate per acre is, however, obtained only for a year or two after applying the molybdate, and it is necessary to apply the dressing every year to ensure a continued alteration in the nature of the plant association in the herbage. The accumulation of nitrate in the plants of molybdenum-deficient pastures suggests that molybdenum is necessary for the production of protein.

Herbage plants grown on alkaline soils containing a high concentration of molybdenum may accumulate large amounts of the element. But while molybdenum is an essential nutrient for the herbage, only a very small amount is necessary, and deficiency symptoms in plants are discerned only when the molybdenum is practically absent. Thus the small quantity that becomes concentrated in the seeds of the herbage plant may be sufficient to allow for the growth of the young plant to maturity. The accumulation of nitrogen in the tissues of the molybdenum-deficient herbage suggests that molybdenum is involved directly in the production of nitrate within the plant tissues.

Molybdenum deficiency *per se* is probably not experienced by the higher plants grown in agricultural soils. The tremendous stimulation of clovers grown on some grazings is apparently secondary to increased nitrogen supply brought about by the effect of molybdenum on the soil bacteria, since it has been demonstrated that an application of nitrate brings about the same effect. Brassicas (turnip and similar root crops) and tomato plants have been observed to suffer from the effect of molybdenum deficiency in certain soils.

TRACE ELEMENTS AND NUTRITION: 1. MOLYBDENUM

The spectacular stimulation by molybdenum of clovers grown on some of the hill grazings simulates the response following the application of nitrate to the herbage. There is also some suggestion that excess of manganese tends to induce symptoms of molybdenum deficiency in plants. The application of lime or basic slag to hill grazings encourages the liberation of molybdenum from the unavailable state in which it occurs on certain soils, and so greatly increases the uptake of the element by the plants. The tendency of the plant to accumulate molybdenum from the soils is increased by the addition of a phosphate manure and may be decreased by the addition of sulphates.

Next month : Copper

A LABOUR-SAVING PIGGERY

STEPHEN M. HAWES, A.C.G.I., B.Sc., A.M.I.C.E., A.M.I.B.A.E.
Aldeburgh, Suffolk

Up to 350 baconers can be housed successfully in Mr. Gooderham's new piggery at Sudbourne, Suffolk at a total labour cost for management of less than twenty-four man-hours per week.

THE main requirements of an efficient piggery are well known to all pig-keepers, but few designs can meet all needs. Some features, such as the provision of a dry, draught-proof bed area, are essential in any design, but there are many incidentals which can make for better food conversion ratios, improved heat conservation, and greater saving of labour, and which can be achieved at a reasonable cost. With new materials, new methods are possible; and it was the appreciation of this which led Mr. Gooderham, when considering the building of a new piggery at his farm at Sudbourne, Suffolk, to adopt proposals which appeared to offer considerable improvements over traditional methods. The erection of a piggery to meet most, if not all, the requirements is easy if its cost is no object. The problem here, however, was to meet as many demands as possible at the lowest cost, making sure that all extra expense would be recouped by greater economy. To find the most economic solution to any problem, it is very often necessary first to experience failure, and then make the minimum of addition to obtain success. It was with this in mind that the design of the piggery was tackled, and although many things were omitted which at the time it was thought would eventually have to be included, in point of fact a number of these "essentials" proved to be unnecessary, notably in the field of heating and de-humidification.

Before giving details of the various points which led to the design, a brief description of the building will give the reader some idea of the general layout. The piggery consists of 36 sties (18 pairs) lying on either side of a central feeding passage. These sties are housed within a rectangular building 254 feet long and 24 feet wide, semi-circular in section. There is a raised meal store at one end and a sunken muck tank at the other. Outside one end there is a concrete apron on which is built a circular muck heap. The drainings from this heap return to the muck tank. Alongside the apron is

the straw stack. An exhaust fan is set in each end wall of the building, and there is an air inlet in the centre of the roof.

The layout is basically that of the Scandinavian type of house—a pattern adopted as being the most economical to erect, as well as facilitating the flow of mechanized operations. For example, food is brought in at one end and distributed down the centre. The pigs eat the food from the centre but deposit their dung at the outside edges, from where it is scraped to one end and deposited in the muck tank. All movements are in a straight line and therefore simpler to accomplish. Also, the pigs have a straight run from their sties to the weighing machine, thus avoiding the chaos which occurs when herding pigs around corners. This layout keeps the food well away from the dung, and the pigs, who appreciate being able to keep clean, seldom dung in the bed area.

Fresh Air, Warmth and Feeding Ventilation, which has for so long been the downfall of Scandinavian-type piggeries in this country, was the next consideration. At the time (1951), dung passage inlets and ridge extraction was still considered to be a satisfactory method. But this did not appear to be at all sensible, for the fresh air, usually at low relative humidity, had first to cross the dung passage, thus helping to evaporate the ammonia from the urine and causing the air to be fouled before it reached the pigs—to say nothing of the loss of nitrogen from the urine. Obviously there should be as little air movement as possible in the dung passage. As some form of automatic air control was envisaged, it was essential to keep the inlets and outlets to a minimum, and therefore centre-to-end flow was adopted. Thermostatically-controlled exhaust fans were installed in each end wall, and the air was allowed in through a baffled vent placed centrally in the apex of the roof. It was not overlooked that this method of ventilation might encourage the spread of disease if it occurred, but the results have shown that a healthy pig is less likely to catch infection than one which has rapid temperature changes and draughts to contend with.

The floor and the whole building were insulated, the latter by a quilt placed between the lining and the cladding. In this way condensation is prevented. Thus ventilation can be controlled to suit the pig rather than to suit the building, for a reasonable humidity of 60–80 per cent will invariably give condensation on a cold day if the building is not insulated. Several factors affected the choice of building, but the high roof of a semi-circular building was a point in favour when using centre-to-end ventilation. The space above the pens acts as a duct and also as a heat exchange area, where cool, fresh air mixes with warm but staler air, so that the pigs are not subject to extremes of temperature but have a steady supply of warm and reasonably fresh air. It was not thought necessary to double glaze as the area was so small, so provision was made for the condensation from the windows to drip into the dung passage.

The temperature within the building is kept constant to within ten degrees Fahrenheit, the average temperature being 60°F. in winter and 65°F. in summer. The relative humidity varies with the humidity of the incoming air, but is usually between 50 and 80 per cent. The higher figure is preferred, since it is less likely to lead to evaporation in the dung passage, and provided the temperature does not rise above 70°F., the pigs do not show any signs of discomfort.

The troughs are designed for dry feeding, and water is laid on in each pen to bowls with a press button type of tap. The bowls are placed near the

exit to the dung passage, so that any splashes are quickly drained away. The feeding passage has been designed to reduce labour to a minimum, and also to obtain the economy of a small span roof. The meal, brought to the farm by lorry, is unloaded into a meal store which is at the same height as the floor of the lorry. It is stored here in sacks, and emptied into the feeding trolley when needed. The feeding trolley runs down the passage, which is also at the level of the meal store, and the meal is weigh-batched out from the bottom and dropped into the hoppers. The latter lie centrally in the floor of the feeding passage, forming part of a single central dividing wall surmounted by the feeding passage. Apart from the labour-saving aspect, this method of obtaining a single, solid dividing wall excludes draughts; air cannot drift across from cold, empty sties to the warm, full ones, as happens with a railed passage or one where the trough forms an opening at the bottom. Each pen becomes a completely surrounded pit in which draughts are almost, if not completely, eliminated. Patent rights of this design are pending.

No Bedding Straw The primary break with convention was the decision to do away with straw entirely. It was reasoned that unless pigs are kept in very deep straw, they are more often than not actually lying on concrete. The insulation of a well-trampled layer of straw is small, compared with that of a well-insulated floor, and apart from the fact that the straw soaks up urine, it seems to have little purpose. To convert liquid urine, which will flow away of its own accord, into a sodden mass which has to be forked into a barrow and carted away, only makes work. A drainage system was therefore put in to carry the urine away from the dung passage. Sometimes a little peat moss or sawdust is used to "house train" any pigs which are using the wrong part of the sty for dunging, but generally speaking this is not necessary, and the pigs keep clean and healthy.

Naturally, a certain amount of fouling of the bed area does occur, particularly near the entrance to the dung passage, where the wet footmarks seem to encourage dirtiness. So before mucking out, the sties are swept to remove any mess to the dung passage. The doors are then closed, and an electrically-driven scraper is drawn down the passage, collecting all the solid muck and cleaning out the slot channel which runs along the dung passage. This slot runs the whole length of each side of the building, and all liquid in the dung passage is quickly drained off by means of this slot into closed drains before it has time to lose its nitrogen and foul the air. The muck from the scraper is dropped into the tank at the end of the building, where it is mixed with the liquid drainings from the slot. The entire effluent from the building is then mechanically sprayed on to a muck heap.

This effluent can, of course, be disposed of in various ways, such as spraying direct on to pasture, but at Mr. Gooderham's farm pasture does not come into the rotation, so the straw, which is stored in the open, is used to form a large composting or rotting heap. At present, the actual making and turning of the various layers necessary for a true compost is not carried out, but it is found that after a year the intimate mixture of muck and straw is well rotted. All the drainings from this heap, arising from rain and excess liquid, are drained back into the tank and re-sprayed the next time.

Calculating the Saving The saving in labour achieved by this piggery may be judged by the following. When full, the building will hold about 350 pigs up to bacon weight, and the daily time taken to feed and clean out is between two and three man-hours per week. The outside

work amounts to about two man-hours per week with tractor and foreloader strawing the heap. When the stack is close to the heap, the foreloader is not necessary. The pumping out of the effluent is done while other work is being carried out in the building, and when the heap is saturated more straw is added. The total man-hours for the week amounts to not more than twenty-four. The power used for scraping and muck spraying costs about 8d. a day. If the labour cost of mucking out is added to the depreciation and write-off of machinery, the cost of producing a cubic yard of muck amounts to 2s. 9d., compared with 6s. 9d. in a similar piggery mucked out by hand. The manurial value of the muck has been analysed, and one cubic yard has a value in nitrogen, phosphates and potash equivalent to 11s. 6d. worth of fertilizer.

Similarly, allowing for labour and write-off of the weigh-batcher, the cost of feeding is 1s. 6d. per pig fattened from 50 lb. to bacon weight. Water and electricity can be covered by 6d. and building write-off by 10s., making a total fattening cost of 12s. per pig, excluding the cost of food. During this time each pig produces about ¾ cubic yard of muck, the net profit (equivalent value of fertilizers less cost of production) of which is 5s.

The perfection of these various innovations has taken considerable time and patience, and the writer wishes to thank Mr. G. A. Gooderham for his invaluable assistance. Without his willingness to carry out the many experiments which were necessary, final success would have been impossible.

GROWING WOOL

G. L. WILLIAMS, B.Sc.
University College of North Wales, Bangor

What can be done by wool producers to combat the increasing competition from new synthetic fibres? Mr. Williams suggests the answer in the case of Welsh hill sheep lies in closer attention to management and breeding aimed at the production of a more uniform, heavier fleece.

WE are sometimes apt to forget, I think, that the keeping of sheep for wool was the earliest form of commercialized farming, and that wool was once the basis of Britain's export trade. Nowadays our mills obtain most of their raw wool from overseas—notably Australia and New Zealand. No less than 310,576 tons of wool were imported into this country during 1952. Nevertheless, British growers produced nearly 30,000 tons, or £14,912,944 worth of wool in the same year. So long as sheep are kept in this country, we shall continue to produce wool, and even though we cannot hope to compete with Australasia in cheapness of production, wool must still be regarded as a valuable by-product of the mutton and lamb industry, and more attention should be paid to it.

We are all familiar now with nylon and rayon and accept them as useful materials without considering them as rivals to wool. Wool has always been regarded as being such a special fibre that it could never be superseded by a synthetic product. Alas, this belief has now been shattered, for a new synthetic fibre possessing most of the attributes of wool has appeared on the market. The seriousness of its competition can be judged from the fact that

one firm intends spending £20 million on new plant during the next few years to increase the output of this fibre to 10,000 tons a year. Of course, the absurdly high prices which were paid by buyers of Australian wool a few years ago, when world supplies were scarce, probably acted as an incentive to the synthetic fibre manufacturers in their efforts to produce cheap substitutes. Our own Wool Marketing Board, like those of Australia, New Zealand and South Africa, have to face the reality of the situation; and one sure way of meeting this competition is to produce cheaper wool. This does not necessarily imply lower returns from the sheep or land, because there is ample scope for increased production on our farms.

Aims in Breeding A common fault in our wool clips is the lack of uniformity in quality. A synthetic fibre factory will always turn out a standard product. Breeding may be the answer to this problem, for certain flocks and breeds have reached such a standard of excellence that there is now very little variation in the quality of fleeces.

Variation in the fleece in lowland flocks is surely a sign of poor breeding, or absence of breeding, since all the sheep are kept under the same conditions of feeding and management. There is no such thing as the "best type of wool," but some farms (or districts) are better suited to produce certain wool types than others, and local practice is usually a safe guide to newcomers. Long wools are believed to be more suitable for very rich grassland than short wools. Striving for uniformity of fleece in hill breeds is not realistic, since environmental conditions differ so much. On the other hand, a certain amount of *flock* uniformity is possible. In Welsh hill sheep most of the flocks have less than 200 breeding ewes, the larger flocks usually being divided into self-contained sections. Considerable variation exists in wool type, ranging from the very short, fine fleeces to the longer stapled, coarser and heavier fleeces, and kemp (both red and white) may be found in all types. Now kemp is not favoured by buyers, and it can be bred out of the wool if necessary, although it is debatable whether this is desirable. A few decades ago selection was directed towards the non-kempy fleeces of fine quality, obtained by the use of pedigree Welsh Mountain rams, but this resulted in shorter staples and reduced fleece weights unsuitable for hardy sheep on the Welsh hills, and it is sometimes even claimed that the sheep themselves became smaller in consequence. Today, the bonus on quality is not sufficient to make the production of fine wool attractive—at least not in the Welsh breed.

On poor hill land the coarse, or "primary," fibres seem to have first call on available nutrients, while the finer, or "secondary," fibres are the first to suffer from poor nutrition. Wool surveys in New Zealand (1) have clearly shown that it is generally better to aim at higher fleece weights rather than improvement in quality or fineness of fleece. But are higher fleece weights always desirable? There is a danger that by concentrating too much on wool, the mutton characteristics and milking propensities of the flock may be impaired, in the same way that undue attention to show points in some dual-purpose breeds of cattle has affected their milk yields. Specialization is now the key word of some efficiency experts, but in sheep farming at the present time we cannot afford to specialize in wool to the detriment of lamb production. For it does not follow that the sheep clipping the most wool will also rear the best lambs.

One way of increasing fleece weights is to breed bigger sheep, for up to a certain point fleece weight and staple length are closely linked with body weight. In some breeds, however, it has been definitely shown that wool

production per unit weight of sheep declines once the sheep exceed a certain body weight. Moreover, on hill grazings the size of sheep is limited by the availability of food, so that two small sheep not only show higher returns, but they have a better chance of surviving than one sheep twice their size. A reduction in flock numbers should result in bigger sheep, except on common grazings where there is no fixed grazing policy. In such circumstances a farmer does not benefit by keeping fewer sheep if his neighbours automatically keep more!

At this point we might face up to another problem. Is the farmer interested in individual fleece weights, or in total production from the farm? The following results from a New Zealand grazing trial (2) concerned with fat lamb production illustrate the problem very well.

	Stocking Rate		
	4 Ewes and Cattle per acre	6 Ewes and Cattle per acre	8 Ewes per acre
Mean fleece weight (lb.)	9.8	9.3	8.7
Wool per acre (lb.)	47	62	81
Lamb per acre (lb.)	166	241	262
Total meat per acre (lb.)	307	298	262

Under these conditions increased stocking with sheep resulted in higher yields of lamb and wool per acre, but lower fleece weight per sheep. Considerable care is therefore necessary in interpreting wool records, unless all the relevant information is available. Thus it is often said that the fleece weights of Welsh Mountain sheep are far too low in comparison with, say, the Scotch Blackface. But, if we go further into the comparison we find that wool production per acre is considerably higher in Wales. The success of some of our leading breeders is due largely to good management, or lower-than-average stocking rates. The high prices they get for their rams more than compensate for their reduced wool cheques. Even so, fleece weights are a good guide to the standard of management; if they are well below the expected average, then there is something inherently wrong with the farmer or his sheep.

Length of Staple and Fleece Weight There is a very close correlation between length of staple and fleece weight in most breeds, provided, of course, that density is not unduly sacrificed. Work at the New Mexico Experimental Station (3) with Rambouillet sheep has shown that increasing staple length beyond the average had a greater effect on the yield of clean wool than did increasing the density of fibres. Again, selection for finer wool by Rae in New Zealand Romneys resulted in shorter staple length and lower fleece weights. The figures below also show the effect of quality on fleece weight in American range sheep(4):

	Type of Wool		
	Fine	Medium	Coarse
Mean fleece weight (*lb.*)	4.05	4.65	5.35

Over the last few years we have found that Welsh sheep in our College flock with longer fleeces than average consistently clip about ½ lb. more wool than those with shorter stapled fleeces. The value of that extra amount of wool from a flock of 600 ewes, based on last year's (1953) average price of 5s. 2½d. per lb., comes to £78 2s. 6d., which might make all the difference between profit and loss. It should be pointed out that these "longer" fleeces were, in fact, only 4-4½ inches at shearing time, and were still fairly dense.

There is also some evidence—although by no means conclusive—to show that in bad seasons sheep possessing comparatively long fleeces appear to be better adapted to the hard conditions and thrive better than those with shorter wool. In good seasons the type of fleece is not so important, so that any conclusions on the ideal type of sheep for certain conditions must be based on observations over several seasons. Of course, lengthy fleeces are sometimes an embarrassment to hill sheep, especially in snow, and local environment should be studied carefully before deciding on a certain type of fleece. In his efforts to increase staple length, the wool grower should always remember that Welsh sheep are kept to produce Welsh, and not Scottish, wool! Undue attention to length will naturally affect density, so that the desirable features of Welsh wool may be lost.

As I mentioned earlier, kemp is usually present in the wool of hill sheep and is regarded by most farmers as one of the attributes of hardiness. A few years ago rams with plenty of red kemp were in great demand, since they were thought to be extremely hardy. But moderation has now prevailed. The presence of red kemp not only reduces the value of wool, but as far as we know, it is not essential to hardiness. A moderate amount of white kemp, however, has no effect on the value of the fleece.

Can we breed for Heavier Fleeces? The present average fleece weight of Welsh wool is under 2½ lb. and an increase to at least 3 lb. is certainly possible, for although heritability of fleece weight is rather weak, the repeatability values are fortunately quite good. In other words, the chances are that ewes with heavy fleeces this year will have heavy fleeces next year, provided, of course, that the same system of management is adopted. We are thus on fairly safe ground in selecting for certain features, such as staple length or hairiness, when culling ewe lambs. Culling is often frowned upon by some authorities, but even if it has no bearing on the following generations, it can have an appreciable effect on present returns.

Age has an important effect on fleece weight. In our flock at Bangor the ewe lambs or hoggs clip about ½ lb. more wool than the ewes, and the quality is better. The following figures have been recorded:

Effect of Age and Season on Fleece Weight

Ewes Born	First Clip	Second Clip	Third Clip	Fourth Clip
	lb.	*lb.*	*lb.*	*lb.*
1949	3.26	2.51	2.60	2.60
1950	2.80	2.15	2.48	—
1951	3.11	2.82	—	—
1952	2.94	—	—	—

The fleeces from the two-shear ewes, following their first lambing season, have generally been much lighter than the previous or subsequent clips, although their lambing percentage was a good deal lower. Last year, however, it was very gratifying to find that they outyielded the older ewes. This, we hope, was due to the heavier culling of ewe lambs and a change in breeding policy, since feeding and management remained the same.

Value of Progeny Testing The only certain way of improving fleece weights, or indeed any other character, is by progeny testing. Elaborate progeny tests for sheep are not essential on the farm, provided conditions of feeding and management are kept the same for all

the progeny groups. The effect of poor wintering on ewe lambs is illustrated very well by the following results obtained by Davies ([5]) at Bangor in the 1949-50 season:

	Winter Gains or Losses	1950 Fleece Weight	
	lb.	*lb.*	*oz.*
Good wintering	+14½	3	9
Poor wintering	− 2½	2	9

Separate enclosures are required for mating, and only the most promising of the new rams should be progeny tested. Far too many rams are used on some farms, so that the good rams have very little lasting effect on the flock. A 200-ewe flock needs five or six rams, or two to three fresh ones every year. Testing the new rams on an unselected sample of ewes would be a good practice. The more new rams we can test, the greater are the chances of finding a first-class one. Neighbours could co-operate a lot in this work, the good rams being exchanged after two years, instead of being sent away to a sale.

At lambing time the shepherd can mark the lambs with the same mark as their mothers. Individual identification is not essential, since we are concerned with the groups as a whole. The marks should be renewed when necessary, so that the different progeny groups can be examined at weaning and again at shearing time.

By comparing the progeny of rams tested at the same time, one can pick out the good from the bad rams. Group uniformity is rather important, since progressive improvement is required, and it is therefore preferable to have a ram with most of his daughters clipping around the 3 lb. mark, rather than one whose daughters' fleeces range from 4½ to 1½ lb. but still average 3 lb. Shearing day is, of course, the busiest of the year, but one should spare a thought for next year's clip by recording the wool weights of the groups and, if possible, draft the groups before shearing, so that each can be sheared separately. Again, the catchers could allocate certain groups to different shearers, and the wrappers could then put the fleeces on one side for inspection and weighing on the next wet day. This sounds rather complicated, but in practice a good organizer is able to keep the work going smoothly.

Healthy Sheep give Healthy Wool Experience and experimental work have shown that for maximum lamb and wool production one should try and winter the in-lamb ewes fairly well, especially during the last six or eight weeks of pregnancy. Coop ([6]) has shown that feeding at this time has a greater effect on wool growth than it has during lactation. In lowland flocks, where high lambing percentages are expected, steaming-up of the in-lamb ewes is well worth while, since the resultant lambs are heavier and stronger at birth, and their mothers have well-developed udders with plenty of milk. It is, however, doubtful whether hill ewes should be fed too well during the last month of pregnancy, since a lamb may get too big for the small ewe, and difficult lambings and losses will occur. On the other hand, there is very little danger of hill ewes becoming fat at this time: in fact, they are usually too thin and weak. Accordingly, a little improvement in their condition is worth considering. The wool clip will be improved in this way, not only by higher fleece weights, but by avoiding the loss of wool through shedding. "Bare" ewes are a common sight after a severe winter, the sheep having shed their wool with

the growth of fresh grass in May. This "break" in the staple is usually associated with lambing, and some New Zealand farmers are now attempting to eliminate this undesirable feature by shearing the ewes before lambing.

Healthy, well-grown wool depends on healthy sheep; parasites, both internal and external, should not be tolerated. It is now two years since the last outbreak of sheep scab in this country, but no one would dream of doing away with dipping. Many farmers believe that phenolic winter dips have a weather-proofing effect on fleeces, and while there is no real evidence to support this theory, there appears to be no reason for changing this dip, since it serves its purpose and is inexpensive to use.

During the last few years many farmers have lost a good deal of money because of the "canary yellow" stain in their wool. Its cause is not known, but it is more common in some seasons than others. A report published by the British Wool Marketing Board in 1952 (7) concluded that "nothing can be done to counteract it". The problem deserves more attention from our wool scientists, however, and sheep farmers should not be satisfied until some remedy is discovered.

References

1. Controllable Factors which influence Wool Returns. E. A. CLARKE. *N.Z. J. Agric.*, 1952, **84**, 20-3.
2. *Annual Report, N.Z. Dept. Agric.*, 1953.
3. *New Mexico Agric. Expt. Stn. Bull. No.* 305. 1943.
4. *Wyoming Agric. Expt. Sta. Bull. No.* 296, 1950.
5. Wintering of Welsh Mountain Ewe Lambs. G. M. DAVIES. *Agriculture*, 1950, **57**, 379-83, and unpublished.
6. Wool Growth as affected by Nutrition and by climatic factors. I. E. COOP. *J. agric. Sci.*, 1953, **43**, 456-72.
7. *Annual Report, British Wool Marketing Board*, 1953.

Some Articles of Outstanding Interest

● NEXT MONTH ●

Electricity in Crop Production	by R. LESTER STEYNOR
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HASGUARD AS A CENTRE FOR BEEF AND MUTTON

R. PHILLIPS, M.SC.

University College of Wales, Aberystwyth

With the approaching changes in the marketing of fatstock, it is interesting to examine some of the effects which Government policy has had on meat production over a period of years. The records of one of the collecting centres in west Wales, serving the mild coastal plains of Pembroke, provide the basis for this survey by Mr. Phillips.

HASGUARD is just a village in the heart of the Dale peninsula in Pembrokeshire, which since 1940 has served as the fatstock collecting centre for the eleven small parishes to the north of Milford Haven. It is situated in a bleak, treeless countryside, facing the might of the south-westerly Atlantic gales. Most of the surrounding land is low, and the soils have been derived from the underlying Old Red Sandstone formation. The total farming area of the eleven parishes is only about 19,000 acres, or just under 5 per cent of the county of Pembroke. This small peninsula is not particularly renowned for the quality of its fattening pastures, yet it possesses in its mild climate and long growing season something far more important than the proportion of ryegrass and wild white clover in its swards. The meteorological records compiled at St. Anne's Head on the most westerly tip of the area show that it enjoys a growing season nearly ten weeks longer than much of the inland, lowland areas of west Wales. Its worst pest is the rabbit, its most damaging weed the ragwort, and bloat is an elusive problem on some of its best swards. The total output of meat forms a very small proportion of the national volume; yet if the other parishes of west Pembrokeshire produced comparable quantities, the meat production of west Wales would be more than doubled.

The annual deliveries of fatstock to Hasguard between 1940 and 1952 fluctuated considerably, but it is surprising to find that the trend for cattle and calves followed practically the same pattern throughout the period, although the former were more numerous. Hasguard is one of the few collecting centres in west Wales where the number of cattle has always been higher than that of calves. During the whole of the period farmers in the district continued with the fattening of cattle despite the emphasis on milk production. With sheep, the introduction of the ploughing-up policy at the beginning of the war resulted in a sharp fall in deliveries, but later the lower levels continued to fluctuate from year to year. However, the 1947 figures differed very little from 1946 and 1948, in marked contrast to most of the other collecting centres in Wales, where the much reduced deliveries of sheep reflected the effects of the severe winter of 1946-47. During recent years sheep have been delivered in greater numbers each year, showing that the post-war reduction in the tillage area favours the flock.

As with the rest of the country, one of the most important changes that has taken place at the Hasguard centre in cattle and, to a lesser degree, in sheep, has been the increased seasonality of deliveries. The winter and spring sales of fat cattle have declined and the autumn sales increased, indicating that winter fattening indoors has given way to fattening on grass during summer. The cost and scarcity of purchased concentrates are partly responsible, but it also seems that the seasonal changes in the price structure has not been effective in checking the autumn glut. The change is less pronounced in sheep, for both winter and summer sales have been maintained at a reasonably high level. Elsewhere in west Wales, the change to

autumn deliveries of sheep has been much more noticeable. Only the better and milder areas of the country (as Hasguard) are now able to sell suckling lambs early in the season and to continue with some semblance of winter fattening of sheep for spring delivery. This change in seasonality leads inevitably to the well-known autumn glut of home-produced beef and mutton, and unless the trend is corrected it is likely to become an acute problem under the new scheme of marketing fatstock by auction.

The returns have been analysed in greater detail for the period 1943-52 (with the exception of 1949) and, since "straight" beef cattle (fat steers and heifers) constitute 75 per cent of the total cattle sales, the following discussion has been confined to these categories. For convenience and brevity, the details are given as averages of three yearly periods—1943-45, 1946-48 and 1950-52.

More Steers than Heifers An important feature of any system of fattening cattle is the proportion of steers to heifers. At Hasguard, under the conditions prevailing in the past decade, there has been a gradual reduction in the proportion of heifers, with the result that in recent years twice as many steers as heifers were presented. It has often been suggested that some pastures are more suitable for the one sex than the other, and perhaps with improvements in grasslands and their management what were hitherto heifer-fattening leys have now become more suited to steer fattening. On the other hand, since the average weight of fat steers is nearly 2 cwt. more than that of fat heifers, under the old system, when heavyweights and overfat animals were earning a premium, the choice naturally favoured the males. Under the auction system it may well be that animals of smaller weights carrying less surplus body fat will become popular again. If so, the proportion of fat heifers will probably increase.

During the years under review the proportion of steers in the "special" or S and S.S. grades rose from less than 20 per cent in 1943-45 to over 40 per cent in 1950-52, and for heifers from about 15 to 36 per cent. These increases in the top grades have been at the expense partly of Grade A, but mainly of Grade B, so that there is now a far more uniform product in Hasguard than there was during the war. However, there was no marked increase in the average weight in each grade from year to year. Steers and heifers in the special grade averaged about 1½ cwt. and 1 cwt. more, respectively, than those in Grade A. The inter-grade differences in average live weights remain unaltered, but inter-sex differences at each grade were smaller in the lower grades (B and C) than in the higher ones (S and A). In the early years there was a fair output of fat steers and heifers during the months of scarcity (March-May) and reasonably high deliveries (36 per cent) during the autumn (September-November), but by the end of the period the March-May deliveries were small, whilst the autumn ones had become very high. In both sexes nearly 60 per cent of the total deliveries now take place in the autumn.

A feature of the Hasguard fatstock over the whole period has been the general constancy of weights at all grades, with the exception of the blizzard year 1947, when the average live weight for each grade in both sexes was higher by over ½ cwt. In some cases the improvement was maintained in 1948, but since then the weights have again declined to about their normal levels. In 1947 the blizzard came early in March and the cold, frosty weather lasted for three weeks or more, so that the spring was late, even in these early, mild coastal districts. It is a matter for conjecture whether the hard

freezing which the soil underwent could have led to the production of a better feeding grass.

Many factors, such as age, breed, condition of the store beasts at the beginning of the grazing season, rates of stocking, the relative seasonal growth rates of grass, and the weather during the growing season, affect body size. At present, very little precise information is available on these points of practical interest, but it can be accepted that mild conditions, like those obtaining in this small peninsula, are satisfactory for the fattening of cattle. Hasguard definitely produces heavier cattle than the inland areas, and this may well be the reason why beef production retained its popularity in the district, even in the years when milk production was top priority.

All-the-year-round Production of Mutton and Lamb The annual deliveries of all classes of sheep through the Hasguard centre during 1940-52 averaged about 4,600 and consisted of 86.6 per cent lambs, 10.3 per cent ewes, 2.2 per cent wethers or "sheep," and 0.9 per cent rams. In the production of mutton and lamb there are three important considerations—namely, the annual numbers that are delivered, the carcass weight, and the time of marketing. During the past twelve years the sheep population of the area has suffered many set-backs. In the lowlands the ploughing-up policy reduced both the number and size of the flocks, whilst the blizzards in 1946-47 played havoc with the stock on the uplands. However, the sheep have gradually recovered from both these misfortunes, since prices and subsidies have been arranged so as to encourage mutton and lamb production. It is a fairly easy matter to increase the numbers of sheep. There are some farmers who consider it is equally easy to increase carcass weight, but from the evidence of the Hasguard returns it seems to be easier for the average run of farmers in a district to produce one more lamb of 40 lb. carcass weight, than to increase the average weight of ten lambs by 4 lb. each. The 1943-48 statistics relating to the Hasguard centre, as well as of all the collecting centres in west Wales, show that the average dead weight of lambs remained practically unchanged in these six years. Each collecting centre had its own average lamb: Hasguard produced big lambs, averaging nearly 46 lb. dead weight, whereas Carmarthen produced a 41 lb. and Aberystwyth a 30 lb. lamb. But, between 1950 and 1952 the average Hasguard lamb increased from 46 lb. to nearly 52 lb. dead weight.

As with cattle, body size in sheep depends upon several factors, such as breed and age, food and the weather. The mild coastal areas in west Wales, which are able to carry sheep of the heavier breeds, invariably produce bigger lambs than the colder, wetter inland areas.

Another feature of lamb production in the Hasguard area is that the average dead weight continues to increase from the summer suckling stage (May-August) at 45 lb., through the autumn stage (September-December) at 48 lb., to the winter stage (January-April) at 50 lb. Farmers have thus been encouraged to carry forward their summer suckling lambs to the following spring, instead of marketing them young and buying in store lambs for winter fattening. This improvement in size with increasing age is not obtained in the colder, wetter districts of west Wales, where it is difficult to maintain body size and well nigh impossible to get any increase in weight during December and January.

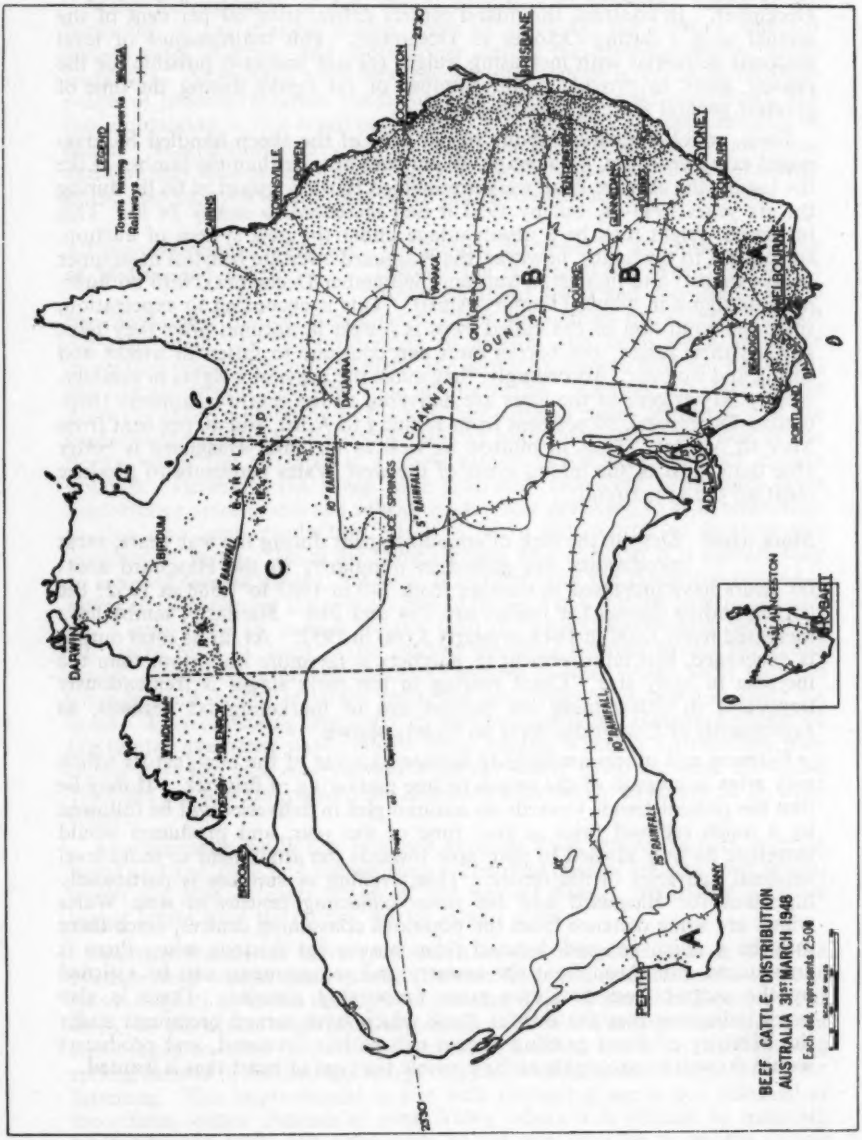
With its climatic advantage it is no wonder that Hasguard has been able to spread the marketing of its sheep throughout the year, and in the future

it should be capable of doing a lot better in this direction. At present, one-quarter of the annual sales occur from January to April, another third from May to August, and the remaining 42 per cent from September to December. In contrast, the inland centres deliver over 60 per cent of the annual output during October to December. This maintenance of level seasonal deliveries with increasing weight for age makes it possible for the coastal areas to provide a fair number of fat lambs during the time of greatest general scarcity (March-May).

Ewes, which constitute about 10 per cent of the sheep handled by Hasguard every year, are, on average, 40 per cent heavier than the lambs. Like the lambs, the average dead weight remained fairly constant at 66 lb. during the six years 1943-48, but by 1952 it had increased to nearly 74 lb. This increased weight may be a disadvantage under the new system of auction. In contrast to the lambs, however, the Hasguard ewes are heaviest in summer (May-August) and lightest in autumn (September-December), with an intermediate figure in winter (January-April). This is according to expectation, since the condition of the culled ewes is lowest in autumn after they have suckled their lambs, but barren ewes can continue to fatten in winter and spring and summer. Accordingly, they make the heaviest weights in summer. Nearly 50 per cent of the ewes are delivered to the centre in autumn (September-December), 10 per cent from January to April, and 40 per cent from May to August. Thus in mutton as well as in lamb, Hasguard is better able than most of the inland areas of the west Wales peninsula to produce meat all the year round.

More Meat Despite the lack of encouragement during the war years, meat production has gained in popularity in the Hasguard area; fat steers have increased in number from 740 in 1943 to 1,388 in 1952: the corresponding figures for heifers are 384 and 548. Similarly, lambs have increased from 3,000 in 1945 to nearly 5,000 in 1952. As far as total output is concerned, this improvement in numbers is far more important than the increase in body size. Good rearing in the early stages is tremendously important in determining the earliest age of marketing fat animals, as experiments at Cambridge have so clearly shown.

Farmers and others are already foreseeing some of the new factors which may arise as a result of the return to free marketing of fatstock. It may be that the present trends towards an autumn glut in deliveries will be followed by a much reduced price at that time of the year, and producers would therefore be well advised to plan now towards the attainment of more level seasonal deliveries in the future. This levelling of supplies is particularly inportant for Hasguard and the other collecting centres in west Wales which are some distance from the populous consuming centres, since there may be a much reduced demand from buyers for fatstock when there is an autumn glut throughout the country and requirements can be satisfied by the output from localities more favourably situated. There is also every indication that the overfat stock which have earned premiums under the Ministry of Food grading system will be less favoured, and producers would do well to anticipate as far possible the type of beast that is wanted.


LEGEND
Towns having meatworks
Railways
BEEF CATTLE DISTRIBUTION
AUSTRALIA 31ST MARCH 1948
Each dot represents 2500
DARWIN
CAIRNS
TOWNSVILLE
ROCKHAMPTON
BRISBANE
SYDNEY
MELBOURNE
ADELAIDE
PERTH
HOBART
LAUNCESTON
PORTLAND
BROOME
WYNDHAM
BROOME
ALICE SPRINGS
CHANNEL COUNTRY
A
B
C
15" RAINFALL
10" RAINFALL
5" RAINFALL

AUSTRALIAN BEEF

1. PRODUCTION AND MARKETING

C. W. STRUTT, B.Sc. (AGRIC.)

Agricultural Adviser, Office of the High Commissioner for the United Kingdom, Canberra

About 12 per cent more beef than before the war is being produced in Australia today, and last year well over 10 per cent of the total production was sent to Britain. Mr. Strutt here discusses the difficulties of raising beef in that vast continent. In next month's issue he will deal with the export market and prospects for the future.

AUSTRALIA has an area of 3 million square miles, and is looked upon as one of the great meat-producing countries in the world, but it never ceases to amaze me that the British Isles, which could be fitted into Australia thirty times, actually produces more meat than Australia! However, the difference between the climate of the two countries is so great that this is not a fair way to look at the position. Owing to the low rainfall over the greater part of inland Australia, settlement has been concentrated on the coastal belt, with the inevitable result that dairying has had the first pick of the best land for the development of pastures. In consequence, as the population has risen, beef production has been pushed farther and farther back into the drier country.

In the south of Australia (area marked "A" on the map), the greater part of the rain falls in the winter, giving rise to a Mediterranean type of climate, whereas right across the north (area "C" on the map) rainfall is concentrated into about four to five months in the summer, from late November to the end of March, with a long, dry spell following. In between these two areas is an extensive tract of country (area "B" on the map) which may experience not only winter rainfall as a result of the spreading northward of the effect of the south polar air currents, but also, in the same year, summer rains due to the southward extension of the monsoon. However, it is also possible for this area to get hardly any rain from either quarter, with the result that the rainfall varies a great deal from year to year.

Another very important climatic factor is the extremely high evaporation rate over large inland areas. There are many parts of Australia having an average annual rainfall of 18 inches or less, but with an evaporation rate of 45 inches or more. The result is that in such areas, unless irrigated, it is only for four to five months in the year that plant growth is satisfactory. This affects fundamentally the types of herbage that can exist, the rate of stocking and the type of stock that can be carried. The risk of drought is high, as also is the danger of wind and water erosion, so that, apart from the most favoured parts of Australia, it is a far more difficult job for a producer to farm his land really well than it is in countries like the United Kingdom and New Zealand.

Table 1 shows the total production of meat in Australia each year for the three years immediately preceding the war and for the last seven years. Examination of these figures shows the considerable variation in total meat production from year to year, and also that the average for the last three years is only 6 per cent greater than for 1937–39. Beef production, however, is up by 12 per cent, thanks to the rapid spread of the practice of running a few head of cattle with sheep in the southern states, where the

Table 1

Total Meat Production, 1937-39 and 1947-53 ('000 tons)

	Beef and Veal	Mutton	Lamb	Pigmeat	Total
1937	551.3	192.1	119.2	92.6	955.2
1938	596.8	206.3	119.0	85.9	1,008.2
1939	559.2	205.8	114.5	86.9	966.4
1947	487.8	182.6	120.0	94.8	885.2
1948	562.0	165.6	129.7	89.8	947.1
1949	577.3	181.3	139.1	93.8	991.5
1950	606.5	205.8	152.3	90.2	1,054.8
1951	651.5	161.8	112.4	85.4	1,011.1
1952	581.9	175.9	106.5	84.8	949.1
1953	674.5	245.7	147.1	84.4	1,151.7

existence of better pastures, due to the more reliable rainfall, permits earlier marketing. Production of mutton is up by about 3 per cent, but there is a corresponding fall in the figures for lamb. The high prices for wool have caused a marked swing away from fat lamb production. Pigmeat is down by 4½ per cent, largely as the result of the shortage of skim milk, arising from the fact that much more whole milk is being diverted to liquid consumption and for manufacture.

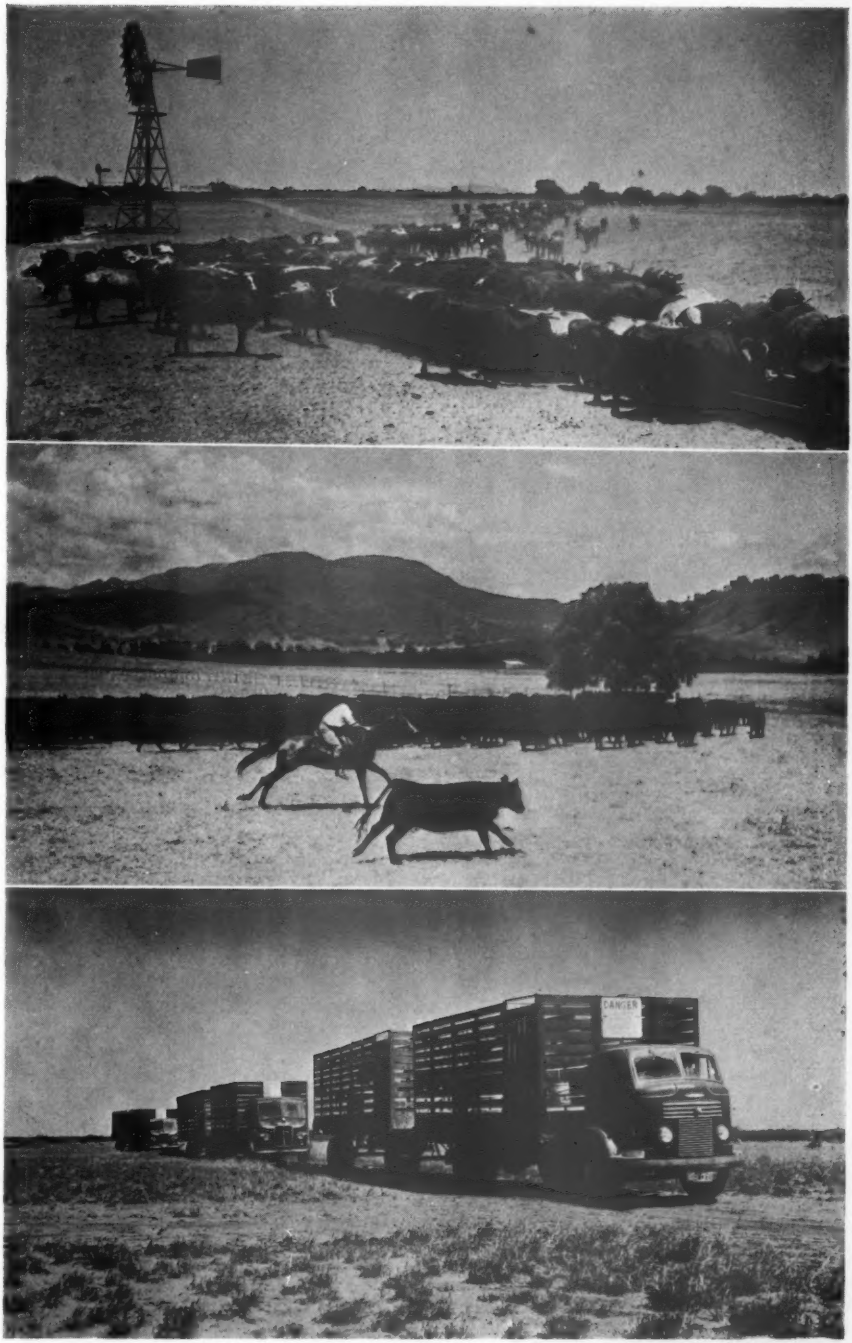
Increasing Output of Beef and Veal It would not be possible in a short article such as this to do justice to all the different classes of meat, and I propose therefore to deal solely with the production of beef. A glance at the map shows the distribution of beef cattle, the position of the larger meatworks and the areas served by the principal railways. It will be seen that the distances from some of the producing areas in northern Australia to the railhead, and thence to the nearest meatworks, are immense. Marketing therefore throws up many problems—a point I will return to later on.

The total number of beef cattle in Australia is about 10½ million, divided amongst the states as follows:

Queensland	5,138,000
New South Wales	2,416,000
Northern Territory	1,058,000
Victoria	776,000
Western Australia	621,000
South Australia	201,000
Tasmania	110,000

Although Queensland carries half the total population of beef cattle, there are in fact fewer animals in the state than there were thirty years ago. This is due to the fact that the country was overstocked at that time—a situation which lead to erosion and severe losses in time of drought. But the numbers of beef cattle in the southern states of New South Wales, Victoria, South Australia and Tasmania show an encouraging increase, amounting to no less than 35 per cent since the end of the war. The corresponding figure for the north of Australia is only 1.5 per cent.

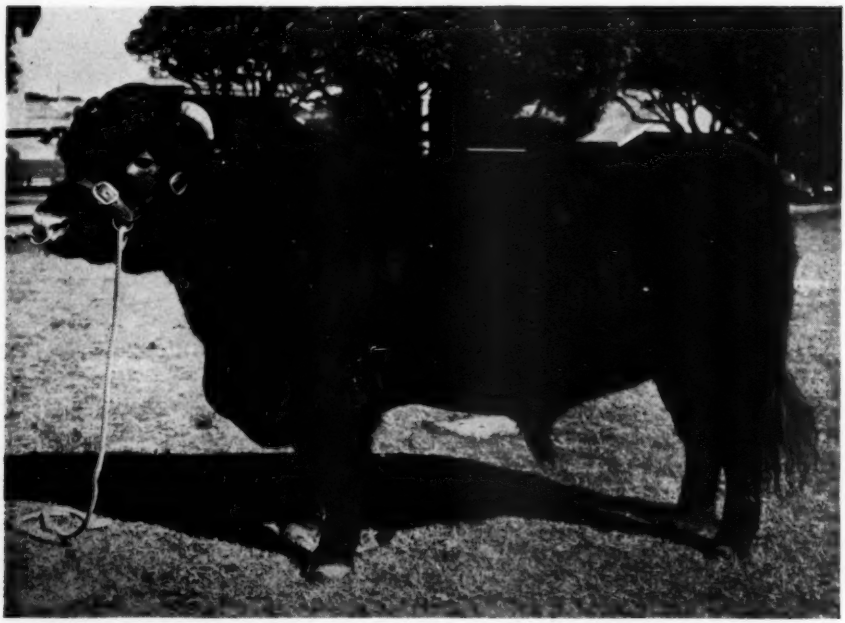
It is also interesting to see from Table 2 on page 75 that the output of beef per thousand head of cattle is now 42 tons per year, representing an annual turn-off of 168 head of cattle per thousand on the properties, compared with an average of 32.8 tons in the period 1945–47, which represents a turn-off of 131 head only. This increase in output of 9.2 tons per thousand head of cattle per year represents 94,760 tons on the total cattle population, and is therefore of considerable importance. Incidentally, the corresponding figures for the



Australian Official Photographs

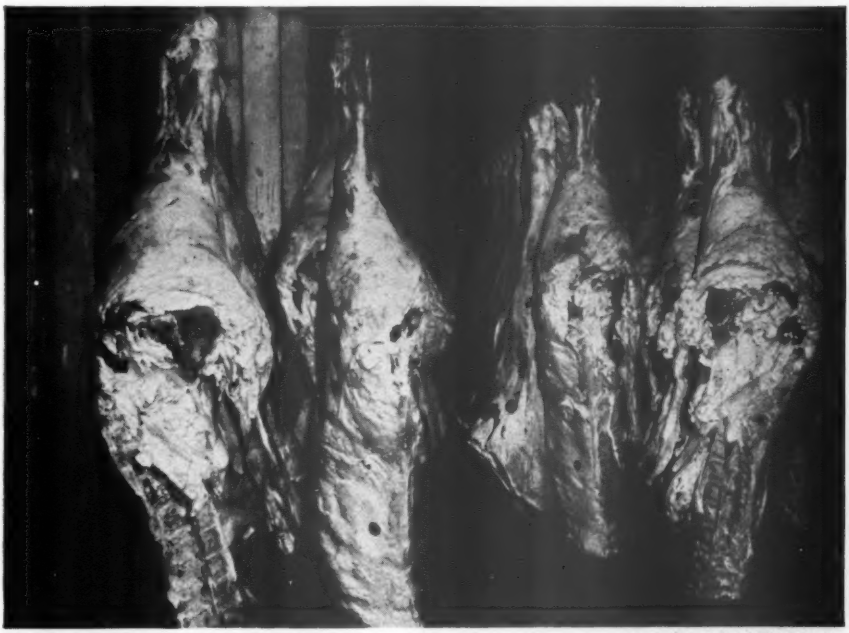
In northern Australia the rearing properties are often hundreds of miles from the coastal meatworks. Droving and road transport reflect the old and the new methods of solving the problem.

VERN VEREKER, a British-bred Hereford sire which cost £A 3,500 when bought in 1945.



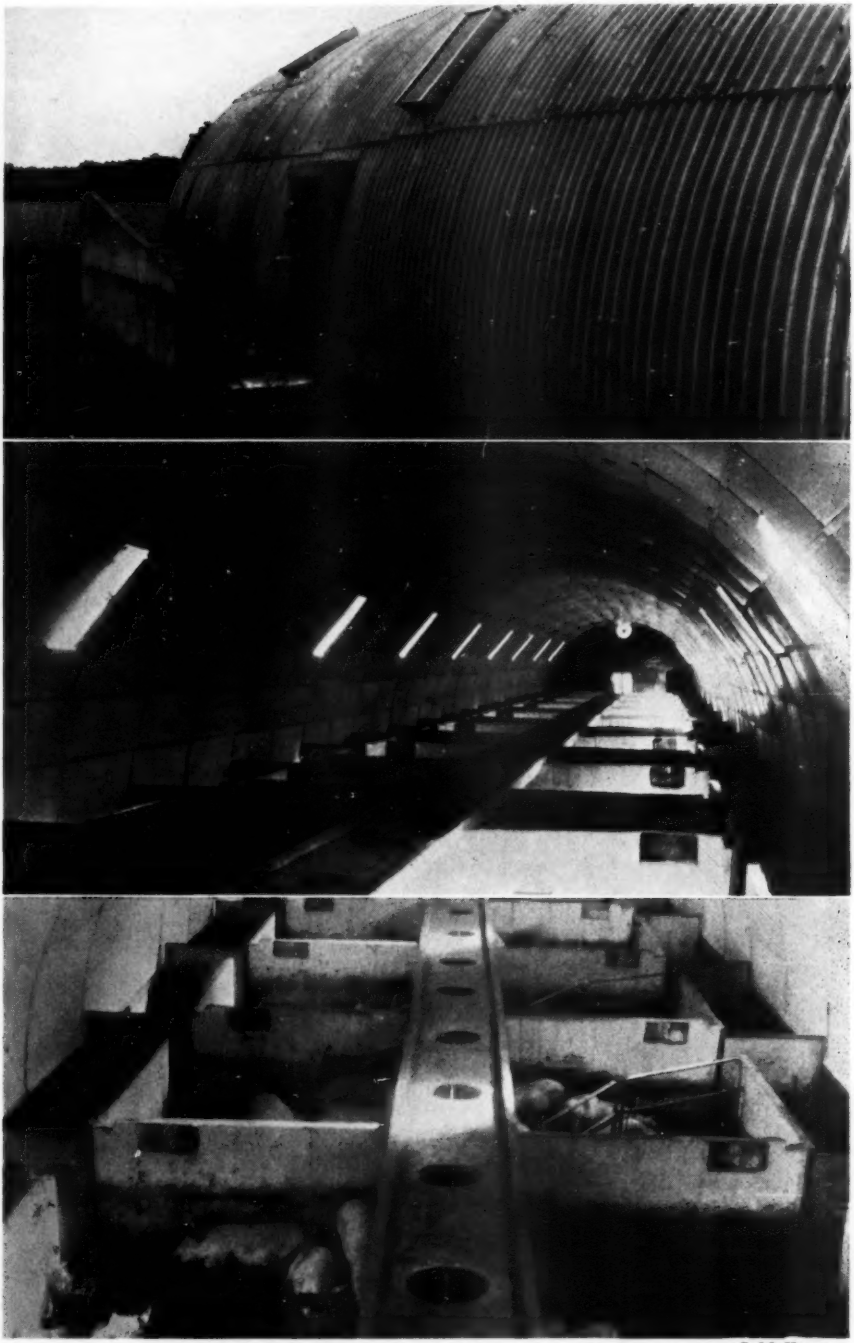
Shorthorn bull, WONGALA ENVOY, for which a record price of 5,400 guineas (Australian) was paid at the 1953 Sydney Royal Easter Show.

Judging Hereford bulls at the Sydney Royal Easter Agricultural Show.



Australian Official Photographs

Meat for Great Britain. Hindquarters of beef in store at Melbourne, Victoria.



S. M. Hawes

Top: The main door and loading ramp.
Centre and bottom: Interior. The muck tank is at the far end.

United Kingdom for 1948–51 are 57.4 tons, representing an annual turn-off of 230 per thousand head of cattle.

Table 2

Production, Consumption and Exports of Beef and Veal

Year Ended Dec. 31	Production		Consumption		Exports		
	Total	per Thousand Head of Cattle	Total	per Head per Year	Total	to U.K.	Percentage to U.K.
	'000 *tons*	*tons*	'000 *tons*	*lb.*	'000 *tons*	'000 *tons*	
1945	461.1	32.7	260.6*	86.7	17.6	5.2	29.4
1946	406.6	29.2	305.2	93.2	40.9	17.7	43.2
1947	487.8	36.4	324.1	96.5	78.7	69.9	88.8
1948	562.0	40.7	371.6	108.9	108.8	98.8	90.8
1949	577.3	40.9	422.4	121.3	78.7	61.9	78.7
1950	606.5	41.5	446.9	124.3	84.7	64.4	76.0
1951	651.5	42.8	491.0	132.3	68.6	47.7	69.5
1952	581.9	39.0	464.3	121.8	39.0	20.8	53.3
1953†	674.5	44.3	462.4	118.4	98.5	78.5	79.7

* This figure does not include consumption by the Armed Forces

† Provisional

Transport Problems in Marketing In the southern states all fat cattle are sold by auction, but in Queensland very large numbers are sold in the paddock. The buyer rides through the cattle to make up his mind what proportion will grade first and second quality on killing, and estimates their average dressed weight at the works, after allowing for the loss in weight and condition as a result of the distance the cattle will have to travel by stock route and by train. This loss will depend on the condition of the stock routes, the skill of the drover, and the condition and age of the cattle at the start of the walk. Producers can, if they wish, consign their cattle to a particular meatworks on a weight-and-grade basis for export at prices laid down in the Ministry of Food schedule. The rates for treatment are different for each state but, for the Queensland works, the average is 2¼d. per lb.

In the south of Australia distances from the properties to market or railhead are comparatively short, and therefore road transport is being used more frequently. But in the north distances are enormous and the farmer has to choose one of four different methods of moving the cattle. First, there is the old system of droving. Cattle, when dispatched in a herd of about 1,200 head in the hands of a good drover with an adequate team of men and horses on well-grassed stock routes, will travel about fifty miles a week and will lose little weight. The cost is about 5s. per beast per 100 miles. On the face of it, this is undoubtedly the cheapest method of transport, but really good drovers are becoming hard to find, stock routes are often not well grassed (particularly towards the end of the season), water supplies are frequently too far apart (especially in the Kimberleys), and the stock routes may be stony and very hard on the feet of the cattle. It is folly to start cattle on a long walk unless they are at least 2–3 years old, and then a distance of 750 miles so affects them that it is at least a year after arriving at their destination before they start to put on weight again.

Rail transport is the best method of moving large numbers of cattle over long distances, but even with this system the doors of trucks must be wide and the cattle must be adequately rested, otherwise bruising and fatigue will

seriously downgrade the whole trainload. There remain then, the two other possibilities of movement by road, as practised in the south, or the more modern idea of air transport. The Australian Meat Board did carry out some trials with beef cattle in road trains, during which 607 head of mixed cattle were moved 476 miles in thirty-six hours, from the middle of the Northern Territory to Mt. Isa in Queensland. They then had to travel 1,030 miles by rail to Rockhampton meatworks on the east coast. Unfortunately, these trials showed that the cost of road transport is too high, except for comparatively short distances, and that rib bruising is severe unless the roads are good.

Finally, then, we have air transport, and in this connection the air beef scheme that operates from Glenroy to Wyndham in the Kimberleys is a most interesting experiment. The aircraft covers a distance of 180 air miles in 1¼ hours, compared with a stock route distance of 240 miles which takes five weeks! This scheme has proved that cattle can be slaughtered inland and the meat chilled and flown to a coastal meatworks without any rise in bone temperature. In this way, considerable savings can be made in loss of weight and condition. It also enables the sending of cattle which would not be worth putting on a stock route, so the proportion of first quality beef is raised to a remarkable extent.

The only snag with air transport is the cost, which works out at 2¾d. per lb. However, considerable economies in this figure could be made if petrol were available in bulk and if a chain of meatworks were in operation to allow the aircraft to be used more efficiently. At present, the Commonwealth Government is paying a subsidy of 1d. per lb. on all meat flown out. There is a strong case for the setting up by the Commonwealth of a committee of experts to investigate thoroughly the economics of air transport in those regions of Australia where, at present, there are no railways, or where the roads are inadequate, before any attempt is made to build them. For the capital cost of building railways and roads would be very high, especially in the north of Australia, where all labour would have to be imported and paid for at incentive rates. Moreover, maintenance costs would also be excessive.

The aircraft at present in general use in Australia can carry 5 tons, but the advent of a much larger freighter aircraft with a capacity of 18½ tons for a stage length of 300 miles at a cost of 1s. per ton-mile makes the use of air transport far more feasible, especially for young cattle that could be loaded at the rate of 5–6 per ton payload.

Inland versus Coastal Killing In view of the harmful effect of long and slow rail journeys on the condition of live cattle, and the fact that a beast weighing 1,100 lb. will yield on slaughter only about 750 lb. of carcass meat and by-products of high value—that is, tongue, liver, hide, etc.—it has been felt for many years that inland killing must be more economic than coastal killing. Some inland meatworks have been operating successfully for a number of years, but the competition of the coastal meatworks is very strong. The latter treat such a large number of cattle that their overhead costs are lower and, in addition, they can make the best use of the less valuable by-products—for example, inedible fat. The coastal meatworks are also in the favourable position of being able to supply the local meat market as well as the export trade, whereas the inland works have difficulty in handling meat for export.

Next month: Exports and the Future

HYBRID SWEET CORN SEED AT WYE

ALLAN A. JACKSON, B.Sc.

Department of Horticulture, Wye College, University of London

Commercial crops of good quality hybrid sweet corn seed have been grown successfully at Wye in both good and bad seasons. The production of the seed was greatly simplified by oven drying at a temperature of between 70° and 90°F.

DURING the last three seasons commercial crops of hybrid sweet corn seed have been produced at Wye College and widely used by commercial and amateur growers under the name of Canada Cross or John Innes Hybrid. This particular top cross was produced as the result of work by C. D. R. Dawson at the John Innes Horticultural Institute. Its development, as the result of a cross between Canada Gold and an inbred line, is described by Dawson in the *Journal of the Royal Horticultural Society* (1). In view of the increasing interest in the use of hybrid corn being shown in Great Britain, both as a high quality vegetable (sweet corn) and as a home-grown stock feed (hybrid maize), it is felt that a description of the technique of production of the seed and, in particular, of the artificial drying method developed at Wye, will be of interest.

The soil at Wye used for the production of this seed is a brick-earth which has previously been dunged for market-garden crops. Before sowing, the land is dressed with 6 cwt. per acre of an inorganic market-garden fertilizer with a high potash content. At the end of April shallow drills are drawn out at 2-foot intervals with the potato ridger, and in the first week of May double rows of "female" seed are sown by hand and covered. Between the double "female" rows a drill is left vacant to take the "male" seed. A week after the initial drilling the first males, or pollen parents, are sown in alternate yard runs in the intermediate drills. A further sowing is made a week later in the yard gaps left. Thus the sowing extends over fourteen days and allows for pollen production over an extended period during the silking of the seed-bearing rows.

During the sowing period and up to spearing a careful watch must be kept for rooks, as these birds can destroy the whole crop. The Frit fly is also a potential menace. The female seedlings will be emerging when the final sowing of males is being made, and they should be dressed against fly damage with DDT or a similar insecticidal dust. Two more dustings are necessary at weekly intervals to give continued protection. The Frit fly problem has been discussed in detail by Haskell (2).

By the second half of July the pollen-bearing tassels will appear, and those on the female rows will have to be removed. When they are large enough to be gripped firmly, a sharp pull will remove them entirely, but if they are pulled too soon some pollen-bearing material may be left behind, and this will cause extra work later on. It may be necessary to go over the field four or five times to ensure the complete removal of tassels. The silks on the female plants shrivel after they are pollinated from the tassels on the male rows, and the seed-producing cobs begin to swell, so that by the end of August or early September the female cobs are suitable for marketing as culinary sweet corn. But another month must elapse before the crop is harvested for seed.

Harvesting and Drying In 1951 the cobs at Wye were harvested from early to mid-October: they were then stripped, suspended on strings from the roof of a shed, and heated by a small coke stove. But the drying process was protracted, moulds developed, and the dried seed was so unsatisfactory in appearance and germination that it was resolved to seek a quicker drying method the following year.

In October 1952 a representative sample of cobs was again harvested and stripped. Although the summer had been a good one from the point of view of seed production, the seeds were still plump and milky, and some concern was felt at the idea of applying normal grain-drying methods to such immature material. However, by the courtesy of the Hop Research Department at Wye, three experimental drying kilns were made available. These kilns were run at 70°, 80° and 90°F. To ensure equal exposure of their surface to the draught the corn cobs were stood upright on the drying floors, and when the kilns were opened after twenty-four hours a characteristic odour was noted and drying was obviously progressing. After seventy-two hours the seeds were flat and shrivelled but they had a good golden colour, as in normal seed samples. At this point the cobs were removed and weighed (Table 1). When a germination test was made it was clear that no harm had come to any of the samples dried in the kilns (Table 2).

Eventually, all the 1952 crop was kiln-dried at 80°F. Just how successful it was can be judged from the fact that samples of the corn received back from the warehouse in October 1953 had retained a germination of 97 per cent.

Table 1

Effect of Kiln Drying Sweet Corn for 72 hours (1952)

Oven Temp. °F.	Weight Before Drying *lb.*	Weight After Drying *lb.*	Loss in Weight *per cent*
70	19.75	15.75	20.25
80	20.75	14.50	30.12
90	19.50	13.25	32.05

Table 2

Germination Test of Kiln-dried Sweet Corn (Started Nov. 12, 1952)

Nov.	No. 1 (70°F.) *per cent*	No. 2 (80°F.) *per cent*	No. 3 (90°F.) *per cent*
17	81	70	57
18	90	86	80
19	95	92	85
20	98	94	96
21	98	98	99
22	99	98	99

Experience in a Poor Season The 1953 season was less satisfactory for seed production than the previous one. June and July were cold and wet and there was much less sunshine than in 1952. The result of this poor season was a later crop, but harvesting could not be delayed beyond early October, for drying in the field ceased after October 11. In addition, mould began to develop below the sheathing leaves of the cobs, and birds became a nuisance. (The effect of time of harvest on seed quality and germination has been investigated by Haskell [3]). In consequence, six days of artificial drying at 80°F. were required before a seed sample of good appearance was produced. The average loss in weight in the drying of the cobs was 52.5 per cent—much higher than in 1952.

During the 1953 harvesting season an effort was made to follow the ripening process in individual cobs in the field. For this purpose six cobs were chosen in the field, and seeds were taken from each of these six cobs at intervals of three days. The samples were then dried to constant weight. This technique has obvious limitations, but the following precautions were taken: (1) only complete, unpunctured seeds were used, and these were immediately sealed in specimen tubes; (2) at each sampling, seeds were taken from approximately the same position on the cob but they were never selected from a position immediately adjacent to the previous sample, as such seeds might have been subject to undue drying; (3) sheathing leaves were tightly replaced after each sampling.

The cobs were studied over a period of seventeen days—from September 29 to October 15. The start of this period was marked by fine weather and the loss of moisture was appreciable. In most cases this loss was as much as 10 per cent of the original water content, and in one case it was as high as 14 per cent. The period ended with rainy weather, and between October 11 and 15 the water content remained stable or increased slightly. At harvest time the seed moisture content varied between 58 and 70 per cent, with an average value of 63 per cent, but a six-day drying period at 80°F. with a good draught successfully reduced the average seed moisture content to 13 per cent. A good draught is necessary to carry off the moisture produced when immature seeds of high water content are subjected to such a high temperature. According to American experience, the figure to be aimed at with sweet corn is 10-12 per cent moisture. However, the sample produced at Wye in 1953 was very satisfactory, having a good appearance and a germination of 98 per cent.

The satisfactory germination of maize harvested in an immature condition has also been noted by Mes in S. Africa (4). When Potchefstroom Pearl maize was harvested with a water content of between 46 and 82 per cent and was air-dried for a week, it was found that all the seed that had a water content of less than 68 per cent at the time of harvest gave 100 per cent germination after drying.

Satisfactory Yields In both 1952 and 1953 the yield of cleaned seed produced at Wye amounted to 19 cwt. per acre. All misshapen or poorly-developed cobs were rejected; only seed from well-shaped, fully-developed cobs goes into the final sample. Under the method of production we followed, one-third of the cropping area is taken up by the unproductive, pollen-bearing, male plants—a higher proportion of males than is usual in American practice.

The writer is indebted to Miss W. Thomas and Mr. J. T. Sykes for assistance with recording; also to the Departments of Agriculture and Hop Research at Wye College for assistance with drying apparatus.

References

1. Sweet Corn in England. C. D. R. DAWSON. *J. R. hort. Soc.*, 1945, **70**, 111-9.
2. Studies with Sweet Corn. The Frit Fly Problem. GORDON HASKELL. *Bull. ent. Res.*, 1951, **42**, 519-26.
3. Harvesting Hybrid and Inbred Sweet Corn Seed in England. GORDON HASKELL. *J. Sci. Fd Agric.*, 1953, No. 9, 433-9.
4. On Possible Cultural Methods for Speeding Up Breeding Experiments with Maize. 2. The Use of Immature Seed. MARGARETHA G. MES. *S. Afr. J. Sci.*, 1953, **49**, 303-7.

BRITISH ANTS

DEREK WRAGGE MORLEY, M.A.(CANTAB.)

The behaviour and highly complex social life of the many thousand different species of ants have long intrigued man's imagination. Mr. Morley has made these ubiquitous creatures his special study for many years, and his account of them in a recently issued *Pelican* book, reviewed in this JOURNAL last October, is specially commended to interested readers.

ANTS are probably the most numerous insects in the world. They are certainly the most ubiquitous, ranging in their distribution from the borders of the Northern Ice Cap in Siberia and Canada, southwards through the tropics to the southernmost tip of Patagonia. Because they live in populous societies, they are usually the dominant creatures amongst the terrestrial insect fauna where they occur, and they are therefore of considerable economic importance. More than 15,000 different species of ants have so far been described, but although only a very few of these are found in Britain, those which are found are of great interest, and several of the species are very abundant. The close kinship of these few species has led to constant arguments between specialists, but most authorities recognize only twenty-seven indigenous British species. A number of other ant species whose true homes are in warmer climates are, however, often found in Britain in hothouses, bakehouses, and the kitchens of restaurants.

The British species of ants include slave-makers, parasites, scavengers, carnivorous foragers and herders of greenflies, but it is probably true to say that only five of these species are well known to the non-specialist. Most gardeners know the small Black Lawn Ant (*Acanthomyops niger*) and the amber-coloured Yellow Lawn Ant (*Ac. mixtus*), both of which are commonly found in flower-beds and underneath lawns and paving stones. The slightly larger and more slender Red Ant (*Myrmica rubra*) is also a frequent denizen of flower-beds and the kitchen garden. Woodland picnickers are often only too well acquainted with the Wood Ant (*Formica rufa*)! This is the largest and one of the fiercest of British ants. It builds large, thatched mounds of twigs or pine needles above its nest. The only other ant which is at all well known is the amber-coloured Yellow Ant of the meadows and dales(*Ac. flavus*), whose grass-covered earthen heaps are so often mistaken for molehills by the hiker. Of these five species, the three *Acanthomyops* and the one *Formica* belong to the same large group of ants—the sub-family Formicinae. The Red Ant (*M. rubra*) belongs to a different sub-family—the Myrmicinae. Indeed, all but three of our native British ants belong to one or other of these two sub-families, which contain most of the ant species that live in really large societies—the most interesting and most successful products of ant evolution.

Two Castes—Workers and Queens The population of an ant community may be as low as twenty or as high as half a million. It varies with the species of ant and with the age and economic success of the particular nest. With one exception, that of the parasitic, workerless ant, *Anergates*, each mature nest contains two different castes of ants—workers and queens. For a short period during the summer months winged males may also be found in the nest. The ordinary ant which is seen running over the gravel path or the woodland floor is a worker ant. These workers are far more abundant than either the males or the queens. They are, as their name implies, the labour force of the community. They are not

completely sexless, and do sometimes lay eggs, but these eggs are never fertilized. Since the sex of an ant depends on whether or not the egg is fertilized, these unfertilized eggs develop into males, except in a few cases when an abnormal occurrence in the development of the egg takes place and workers are produced.

The workers produced from fertile eggs are neuter females, lacking one essential reproductive organ, the seminal pouch in which the male sperm is stored after the marriage flight of the males and queens. They seem to be distinguished from the queens from the moment of the laying of the egg. A worker ant larva cannot, like a bee larva, be transmuted into a queen larva by special feeding. Although the workers possess a few ovaries, they never have wings. The queen ants, however, are born with wings and possess both the seminal pouch and numerous ovaries. They are usually (but not always) noticeably larger than the workers and are the large "winged ants" which suddenly appear on hot, sultry afternoons. The winged ants are not therefore a separate species, but the males and queens of one species or another setting out for their wedding flight. During this flight the queen ants are fertilized by several males, one after another, while in the air. This act of fertilization is the sole function of the male ant in most species: they die soon after the marriage flight and no more will then be seen in the nest until the approach of the next marriage flight in the following year. Only on rare occasions when the weather is exceptional is there more than one flight a year.

The Queen establishes her Colony The life of queen ants, on the other hand, only begins when they fall to the ground after their aerial mating. Their subsequent history may take one of a number of diverse forms, but in every case they first seek shelter and then shake off their wings. After this, the queen may be pulled back into the parent nest, from which she sallied forth a few hours earlier, to augment the egg-laying capacity of the parent community. She may, if she is an *Acanthomyops* queen, or a queen of the Large Black Ant, *Formica fusca*, find a crevice, build around herself a wall of earth and set about the unaided foundation of a new colony. The queen of the slave-making *Formica sanguinea* may set out on a single-handed slave raid on a nearby nest of *F. fusca*. She steals some of their pupae and carries them back to her earthen cell. Then, when the adult workers hatch out they accept her as their queen and collect food to feed both her and her grubs. If she is a Wood Ant queen she may return to her own nest, only to emerge again a day or two later, accompanied by a body of worker ants, and journey some yards off to set up a daughter colony, which is linked from the day of its birth to the parent colony.

Other Wood Ant queens may behave quite differently and found their colonies in the same way as the Jet Black Ant of the woods, *Acanthomyops fuliginosus*. The newly-mated queens of this species seek out the nest of another species of ant, in their case the black *Acanthomyops niger*, or the yellow *Ac. mixtus*. After sheltering in the proximity of the nest for several days, they enter it and seek out the royal chamber of one of the queens, crawl on to her back, and bite off her head. They are then accepted as queens in her stead, and their eggs, grubs and pupae are tended with the same care as those of their victims, and of the remaining Lawn Ant queens. Since the Jet Black Ant queen is exceptionally fertile, Jet Black Ant workers soon begin to appear in considerable numbers, and can be seen on the trails of the joint colony alongside the original inhabitants. Moreover, since the old queens of the Lawn Ants are never replaced by newly-mated queens, once the Jet Black Ant queen is present in the nest the number of Lawn Ant

workers gradually falls, until some ten or fifteen years later no more are to be seen and only Jet Black Ants can be found in the nest.

Several points of interest emerge from this story of the Jet Black Ant queen. First, there are, it will have been noted, several queens in the Lawn Ant's nest. This is true of nearly all ant colonies—a really large Wood Ant's nest with a mound 5–6 feet high, may contain up to a hundred queens. I have collected nineteen queens from a nest with a mound little more than a foot high. Secondly, the queens may live for many years. The late Lord Avebury (Sir John Lubbock) kept a Large Black Ant queen (*F. fusca*) in captivity for nearly fifteen years, but there is reason to believe that ant queens may sometimes live to an age of more than twenty years. Their average life span is probably of the order of five to ten years, and throughout all this time the queen draws upon the sperm obtained on her marriage flight to fertilize her eggs. Worker ants of the same species have lived for seven and eight years in captivity, and most worker ants probably live for at least three years, if not longer. The behaviour of these worker ants varies not only with the species, but also with the individual.

Communal Life and Behaviour The workers of the two yellow species of *Acanthomyops*—the *mixtus*, which are often found in our gardens, and the hill-making *flavus* of our meadows and hillsides—herd plant lice which live on the roots of grass and other plants, protecting them from their insect enemies and feeding on their sweet excreta. Yet the troglodytic nature of their life is not immutable, for when a Jet Black *fuliginosus* queen founds her colony by entering one of their nests, their habits change. As soon as the *fuliginosus* workers appear in any quantity and set out to milk the plant lice on the branches of nearby trees (by stroking them with their antennae), the *mixtus* follow suit and likewise seek their honeydew in the tree tops.

Whereas the weak and parasitic *Anergates* can only live in the nests of its minute but virile cousins, *Tetramorium caespitum*, which is abundant on the sandy heaths of southern England, the British Formicine slave-making ant, *Formica sanguinea*, can live as successfully without its slaves as with them. In this again, the *F. sanguinea* differ from another weakly British Myrmicine, *Strongylognathus diveri*, whose Swiss relatives are also slave-making ants, but obligatory ones who seemingly cannot live without their slaves. Yet even where instinctive patterns of behaviour are strong, as in *Anergates* and *Strongylognathus*, a certain plasticity is retained, This plasticity of behaviour is present to a marked degree in our Wood Ants, *F. rufa*, our Formicine garden ants, *Ac. niger* and *Ac. mixtus* and, most of all, in the slave-making *F. sanguinea*. These ants live in large colonies of thousands of individuals. Their workers can learn simple mazes, and vary in their ability to do so. A few individuals that seem more active are the best learners, and they play a vital role in the colony. They are the "excitement centres" of the community, and it is they who first set about the different tasks of ant life. The energy with which they do this stimulates the less active, poorer learners, into like activities. There is no language, no "come here, do this" ; the excitement centres just set to at the various tasks that awake their own instinctive responses, doing them after the fashion to which they have been conditioned by their learning over the years, and their energy in action triggers off the response to set about the same task in other ants nearby.

The economic success of the large, half-million strong colonies of Wood Ants and Black Lawn Ants depends on the behaviour of these individuals,

and their destruction can upset the foraging habits of the whole ant city. Each of their nests, like those of all other species of ants, has a distinctive badge—an odour, since the ants live chiefly in a world of smells—and each has a history of success and expansion ; of failure and retraction ; of war and peace; of famine and disease ; and of natural tragedies, from fire to flood. The tale of even a single ant community, as, for example, a commune of friendly interlinked Wood Ant nests, would fill a book.

Fifty thousand ants an acre, at a modest estimate, are living their busy lives around us, protecting the hated greenfly, or killing the soft-bodied grubs of wood-boring pests and thousands of other harmful insects besides. Their lives affect ours because of their suzerainty of the soil, for good and ill ; their beneficial aeration of it through their excavations, and their harmful acidification of it by their gastric juices. Only at night and during the cold months of winter are they inactive. Yet for the most part we ignore them, thinking of them solely as nuisances and rarely as pests, as they are in the garden, or benefactors, as they are in the woods. The economic importance of the ants is little recognized, largely because its impact is indirect.

MADEIRA

VERA F. P. DAY, N.D.H.

MADEIRA is the main island of a small group off the west coast of Africa; the rest of the group consists of Porto Santo, some 40 miles distant, with sandy beaches and a dry climate resembling that of Morocco; the Desertas, 10 miles out to sea, barren and uninhabited, except for wild goats and a few seals; and, halfway to the Canary Islands, another small group of rocky islets, the Salvages.

The main island has a delightful climate that combines those of temperate and tropical regions, and there are no poisonous insects. Hot sun, ample but not too heavy rainfall, and cool breezes from sea and mountains provide ideal conditions for plant growth. Everything is perpetually fresh and green, and spring and autumn flowers and crops, temperate and tropical, all flourish together. Although only about the same size as the Isle of Man, it is so mountainous that it seems much larger. The mountains, 6–7,000 feet high, are scarred with deep ravines, and in places drop 2,000 feet sheer into the sea. The little harbour at Funchal is no larger than that of Folkestone, and liners have to land their passengers by launch.

Several types of rock can be distinguished on the island; some are volcanic, others of limestone formations like those of Cheddar and Derbyshire, and some are of granite and sandstone, with strangely shaped pinnacles reminiscent of the Dolomites. Above the level of the pines stretch the moorlands, studded with piles of balanced rocks like the tors of Dartmoor, and in the interior of the island is a desolate, boggy region, perpetually wrapped in drifting cloud, and snow-covered in winter. This is the gathering ground of the water which is brought for miles by *levadas*, stone gutters and tunnels, to the towns and banana groves at sea level, irrigating the little fields on the way.

There is hardly any flat land; no room for an airfield and scarcely landing place for a helicopter. The mountains are terraced on the south side from top to bottom, every square yard being cultivated; even small, flat patches among the rocks near the mountain summits are regularly cut for hay. New fields are made by building retaining walls and filling in the space with soil, like a frame. Few spots defeat the industrious Madeirans, but the eastern-most point of the island, with its rocky outcrops and thin covering of soil, has been left to the naturalized Opuntias and *Aloe arborescens*. In one place a mountainside down to 3,000 feet was terraced to start a new pine forest. The movement of the soil was sufficient to cause millions of pine seedlings to spring up, and all that was necessary was a subsequent thinning out. Resin is collected from the pines, as in the *Landes* of south-west France, and piles of earthenware pots, shaped like flower-pots, were stacked ready for fixing to the trees. *Pinus maritima*, Eucalyptus and *Acacia dealbata* (Mimosa) have replaced the native trees, which were destroyed to make way for cultivation. This has meant a scarcity of wood for fuel, and every dead stick and tuft of pine needles is meticulously gathered and stacked for household use.

Farming in Miniature Natural regeneration is made possible because few goats are kept, and these are never left untethered. The cattle spend most of their lives in thatched barns, but are sometimes taken out and tethered, often by the roadside. Milk is of indifferent quality, and butter is scarce; no cheese is made. Better class families usually keep cows to provide the households with milk, and it is no uncommon sight to see the family cow—often a Friesian—tethered on the lawn of a smart house in Funchal. Most of the cattle are cross-bred Jerseys. European sheep of the Merino or Romney Marsh type are kept in pens in back-yards, but the moors afford pasture to a small breed of sheep with thin faces and legs and extremely thick wool—many are black or greyish brown. I saw no dogs running loose; valuable dogs in Funchal were always on the lead, and the few seen in the country were close at their masters' heels. The latter were small yellow dogs, not unlike Corgis, but with long legs and bushy tails, perhaps the descendants of the native wild dogs that gave their name to Pico Canario, a mountain in the interior, and to the Canary Islands. There are also very few cats, and these only in town. Poultry is not much in evidence; Rhode Island Reds are the most popular breed. I saw no ducks, and just two diminutive geese.

Such is the gradient of the tiny fields that only hand cultivation is possible. The dwarf wheat fields are cut with sickles, scythes being too large. Wheelbarrows are useless, even hand-barrows being impracticable, and enormous loads are carried on men's heads and backs. The womenfolk help with the lighter work in fields and gardens, but the bulk of the work is done by the men. Manure is chiefly town refuse and vegetable waste, spread on the surface and hoed in.

There is nothing haphazard about this rather primitive-sounding cultivation. The little farms and market gardens are well tended, and the crops kept free from pests and diseases by the systematic use of knapsack sprayers —the only machines I saw. Excellent vegetables are grown to supply the hotels and the many ships which call at Funchal. At the time of my visit, in April, the principal crops were lettuces (Webb's Wonderful); radishes; New Zealand spinach; cabbages (Velocity) and French beans. The uncurled parsley is grown, the double curled variety apparently being unknown. Quantities of good onions were being harvested at the drier eastern end of

the island. Carrots and turnips were being brought down from small farms higher up the mountains, where the climate is more like south-west England. Three crops of potatoes are taken in the year. Sweet potatoes and yams are grown, and these, with bananas, pumpkins, and a little fish or pork, make up the diet of the country people, who are practically self-supporting.

Many tropical fruits are grown; oranges, lemons and tangerines, avocado pears, peaches and mangoes, yellow and purple passion fruit among others. Most of the cottages grow pawpaws and loquats: these last, an insipid fruit, are very popular with the natives, and huge basketfuls are sold in the streets. Plums are grown in the mountains, to be dried as prunes, and in April strawberries were ripe and served with fresh pineapple. A few very inferior apples appeared for dessert, very small and dry, more like crabs, and not worth growing.

Crops grown on a large scale are bananas, vines and sugar cane. Bananas are exported to Portugal, and are cut when fully grown but still green, to ripen in storage. They are clean cultivated to allow of opening irrigation furrows, but odd corners and the narrow verges of paths in the banana groves are encouraged to grow a little grass for fodder—even such small spaces are valuable in an over-populated country. At the beginning of the century banana-growing had apparently dwindled almost to extinction, but it is now thriving again.

The fame of Madeira wine is world wide, and the wine trade is of great antiquity. Malmsey, formerly exported in quantity to England, is still made, one brand bearing the significant name of "Duke of Clarence Malmsey". Vines are trained over low, sloping terraces: in Porto Santo they are trained along the ground, as in the Canary Islands. Wood for the wine barrels has to be imported from America, as not enough suitable wood is produced in the island. Wood is too precious to be used in fashioning bungs, so these are made by hand from strips of dried banana leaves—nothing is wasted.

The manufacture of sugar is an important industry, and a ferocious spirit, *aguardente*, is distilled from the cane. In April the cane was being cut, and all day long lorries piled high passed through Funchal on the way to the factories.

Basket-making is another notable industry—in particular, bicycle baskets and wicker chairs of all types. These are in great demand on liners, and are sent all over the world. The work is of very high quality. Willows for the purpose are grown, not in the river-beds, where it is too hot for them, but halfway up the mountains, where they are carefully irrigated. The baskets are made in the villages and collected periodically by lorries.

Flower Garden of the Atlantic The peasants seem to be very poor by our standards, but their circumstances are not easy to judge, for no one looks underfed. In the warmer districts the children especially wear fantastic rags, but these are always being washed; in the colder mountainous regions the people appear to be sufficiently warmly clad in woollen clothes. Nearly everyone goes barefoot—from choice. The little houses, whether tiled cottages or mere thatched huts, are in good order, with shutters and woodwork painted, and walls, gates and roofs kept in repair; the patches of garden can always find room for flowers, so that they have much of the charm of English cottage gardens, though of course they look very different. Madeira has, in fact, been called "The Flower Garden of the Atlantic". Degrading and grinding poverty is not conducive

to beauty, intelligence, cleanliness and thrift, and the Madeirans possess all four.

One of the sights of Funchal is the flower women, in national costume, with their vivid scarlet capes and skirts, striped in many colours, and bearing baskets of rainbow-hued flowers on their heads. Violets and gladioli, freezias and ixias, stocks and arum lilies and many others were on sale in April, but an essential item of their wares were the fine sprays of cymbidiums. These attractive orchids are grown in the only range of glasshouses on the island, and are eagerly bought by home-going visitors on account of their long-lasting qualities. Some which I bought lasted for six weeks after being hung up for five days without water in the ship's fruit store.

It was interesting to see a number of familiar arable weeds. Many are the same as those found on chalk soils in Kent and elsewhere, and include greater celandine, field cabbage, annual mercury, black nightshade, bristly ox tongue, hop trefoil, sow thistle, nipplewort and sun spurge. Others were stork's bill (*Erodium*), scarlet and blue pimpernels, dwarf mallow, goosefoot, lesser swine's cress and narrow-leaved hare's ear. Three very common weeds, especially on fallow land, were a pale pink silene, with buff-coloured seed capsules, a cream-flowered radish, and a very decorative little thistle with mauve flowers, more like a field scabious at first sight. *Galinsoga parviflora* (gallant soldier) and two other *Galinsogas* were common. In the hotel garden two flower-beds were smothered with a pale blue and straw-coloured broom rape. The only plants that seemed likely to be the host were a few odd *Melilotus indica* that had escaped the vigilance of the gardeners.

Vacant building sites in Funchal soon become colonized by a characteristic vegetation, which includes a cream-coloured *Stachys*, *Melilotus indica*, thorn apple (*Datura Stramonium*) and a leguminous plant like a *Baptisia*, with greyish leaves and dark blue clover-like flowers smelling strongly of paraffin. Everywhere between the cobbles there grew a small, ferny-leaved *Cotula*, possibly *C. coronopifolia*, which was left undisturbed, doubtless because the effect was pretty and it kept down other weeds.

I found only one small clump of a dwarf stinging nettle, in a back lane—evidently this weed is not much of a nuisance. A real pest is *Oxalis cernua*, with butter-yellow flowers; there are single and double forms, both equally rampant. This quite attractive plant takes possession of any vacant place, and as it grows equally well under wet or dry conditions, it is practically indestructible. There seemed very few insect pests—possibly these are kept down by the lizards which swarm everywhere, and by the wild canaries.

Until the coming of the petrol engine, there was no wheeled traffic—impracticable anyway on some of the steep cobbled roads. Transport was by bullock sledges. These are still used, but mainly for short distances. The bullocks are very small, not much larger than donkeys, and they can trot at a respectable speed when necessary. Now, excellent motor roads, paved with stone sets and kept constantly in repair, are taken right to the tops of the mountains.

There are several other industries, such as embroidery, fish canning, and the building of fishing boats. It is pleasant to call to mind that English merchants have played, and are still playing, a prominent part in the development and prosperity of this beautiful and fascinating island.

THE CATTLE OF BRITAIN

3. BRITISH-CANADIAN HOLSTEIN-FRIESIAN

THE Canadian strain of the Friesian breed is no newcomer to the United Kingdom. For a number of years before the Second World War, between one and two thousand in-calf heifers, some cows and a few bulls were imported every year through Liverpool, Glasgow and Cardiff, and these animals, by their size, general conformation and udder development, created a favourable and lasting impression among a large body of dairy farmers in many parts of Britain. Some pedigree cattle were included in these importations, and herds were established in Cheshire, Dorset, Somerset and Norfolk. But on the outbreak of war in 1939, the importation of live cattle from Canada ceased abruptly; although with the emphasis on milk production, the consistently good milk yields, reasonable butterfat content and freedom from tuberculosis of the Canadian strain of Friesians ensured continued interest in the breed.

In 1944, as a gesture of goodwill and to enable Canadian blood lines to be maintained in limited degree until importations were again possible, Canadian breeders made a gift to Britain of three pedigree yearling bulls, and these were placed at the disposal of selected dairy farmers interested in the Canadian strain. Then, in 1945, a Mr. J. W. Downs, of Trenton, Ontaria, bought twenty-one in-calf heifers and a herd sire, "Ajax Snowden Inka," specially selected by the Canadian Holstein-Freisian Association, and, with the approval of the Ministry of Agriculture, shipped them to his son, who farms in Yorkshire.

The subsequent issue by the Board of Trade of an open general licence permitting the importation of dairy cattle from the Commonwealth provided the opportunity, early in 1946, for Mr. Edwin de Grey Seaman of King's Lynn to visit Canada as the representative of a group of dairy farmers for the purpose of selecting and buying pedigree stock for shipment to the United Kingdom. As a result of his visit, 192 head, segregated into herd units, were distributed to the group. Later in the same year the British Friesian Society also sent a deputation to Canada to purchase selected stock.

The re-establishment of this import trade in Canadian Holstein-Friesians created fairly widespread interest in Britain, and in 1947 a group of dairy farmers visited Canada to buy pedigree stock for themselves and others. They also brought back a further 90 to be sold at a public auction. The auction, which took place at Kinnerton, Cheshire, was quite successful, and a second shipment was arranged for sale at Yeovil, Somerset. In 1948 two further shipments were received, sales taking place at Crewe and Reading; but, owing to sterling-dollar difficulties, these completed the series of importations.

The refusal of the British Friesian Society to accept for entry in their Herd Book, except through the supplementary register, any imported cattle other than those brought in by the Society, was a great disappointment to the dairy farmers who had not purchased through the Society. But knowing that their cattle were pedigree stock which had originated in some of the best herds in Canada, the owners considered that their animals were more than eligible for a supplementary register, and accordingly they decided to form an independent breed association—to be known as "The British-Canadian Holstein-Friesian Association"—with the aim of maintaining pure Canadian blood lines and promoting the best features of the breed. Female

cattle of known Canadian origin or of typical conformation, which are not eligible for entry in the Herd Book, may be entered in a supplementary register, provided they pass inspection for conformation and meet requirements in respect to milk yield and butterfat content. Male calves are only accepted for provisional registration where their fully pedigree dams reach specified requirements of conformation and production, namely, 8,000 lb. milk as a two-year-old, 9,000 lb. as a three-year-old, and 10,000 lb. at four years or more, with a butterfat content of not less than 3.4 per cent based on the average of six consecutive tests. The bull is entered in the Herd Book proper as soon as it has been licensed by the Ministry of Agriculture.

It may be emphasized that the Canadian Holstein-Friesian is directly descended from Dutch stock, as is the British Friesian (P.I.). Canadian breeders have kept blood lines absulutely pure and there is no supplementary register in the Herd Book of their Association. History records the name Holstein to be of no significance: it arose by accident in a United States Government report and it has continued in use ever since. The development of the breed in North America has been based largely on certain outstanding females, or "foundation" cows. In 1878 a female, "Johanna," was imported into Canada, and she became one of the foremost of foundation cows. Other animals imported and classified as foundation stock were "Tidy Abbekerk" and "Aaltje Posch 4th". The vast majority of Holstein-Friesians in Canada today trace descent from these females.

With no direct imports from Canada since 1948, the supply of suitable sires has become increasingly difficult, but recently the Ministry of Agriculture permitted the artificial insemination service of the Milk Marketing Board to import from Canada, on an experimental basis, a limited quantity of frozen semen from two specially selected herd sires. This semen has been distributed to A.I. stations and is being used to serve only females which are classified as "bull breeders". It is too early yet to measure the success of this venture, but it is hoped that the results will be sufficiently encouraging to warrant the development of the service.

Milk production, as taken from the milk records of more than 75 per cent of the membership, shows the average yield and fat content of the British-Canadian Holstein-Friesian to be as follows:

	Lactations							
	First		Second		Third		Fourth and Subsequent	
Year ended Sept. 30	Milk *lb.*	Butter Fat *per cent*	Milk *lb.*	Butter Fat *per cent*	Milk *lb.*	Butter Fat *per cent*	Milk *lb.*	Butter Fat *per cent*
1951	9,738	3.56	10,888	3.42	11,936	3.31	11,485	3.37
1952	9,754	3.52	9,480	3.56	11,832	3.40	11,163	3.30
1953	9,982	3.52	10,316	3.51	11,636	3.54	11,788	3.37

The average milk production of all lactations and cows, including those in the supplementary register, is as follows:

Year ended Sept. 30	Milk *lb.*	Butter Fat *per cent*
1951	11,027	3.41
1952	10,534	3.44
1953	10,802	3.48

The British-Canadian Holstein-Friesian Association is quite small compared with other breed organizations, but it is expanding slowly and surely. Annual registrations increase progressively, its finances are sound, and pro-

duction records stand up well to those of any other breed. The Association's objective is to improve the breed in the United Kingdom and to build up herds of high performance coupled with economic production.

W. B. Gornall,
Secretary-Treasurer,
British-Canadian Holstein-Friesian Association

4. BRITISH FRIESIAN

DURING the forty-five years of the British Friesian Cattle Society's experience, the breed has had a spectacular rise from comparative obscurity to the proud position it now holds. Today, the British Friesian cow enjoys an unrivalled reputation as a milk producer, and such has been the expansion of the breed that, if non-pedigree cattle of Friesian type are also included, it is estimated that half the milk which appears on the tables of British households is produced by these cattle.

Until 1892, large numbers of "Dutch" cattle were freely imported into this country. The Industrial Revolution created a heavy demand for a liquid milk supply for the greatly increased populations of the industrial towns, and dairymen were quick to realize the potentialities of the Dutch cow in supplying this demand. Importations in those days amounted to 80,000 animals a year. However, in 1892, as a result of outbreaks of cattle pleuro-pneumonia on the Continent, the importation of live animals from Europe was prohibited, and since that date there has been no further free traffic in cattle from the Continent to this country.

At the beginning of the present century there were many breeders, particularly in the eastern coastal regions, who had persevered with the descendants of the Dutch breed, and the British Friesian Cattle Society owes its origin to a group of these breeders who, at the Royal Show at Gloucester in 1909, decided to form a Herd Book Society with the improvement of the breed as its main object. Entry into the early Herd Books was conditional only upon the animals passing an inspection for type, and by 1911 over 1,000 bulls and over 6,000 females had been approved for entry. Accordingly, in January 1913 it was decided that no further entries would be made based on inspection only, and that in future pedigree would be an essential qualification for registration.

From the earliest days it has been the policy of the Society to arrange importations of specially selected animals from overseas with a view to hastening improvement of the British breed in one or more specific directions. The first importation of all was from Holland in 1914, the cattle arriving in Britain only three days before the outbreak of the First World War. This early shipment did much to establish the British Friesian as a definite breed, though on the production side the true worth of the importation is difficult to assess, as in those days, even amongst pedigree breeders, milk recording was the exception rather than the rule. Further importations were later made from South Africa in 1922, from Holland in 1936, from Canada in 1946, and from Holland in 1950.

The importation from South Africa was not such a spectacular success as the earlier one from Holland. It was noteworthy chiefly for the arrival of the famous sire "Marthus". "Marthus" was bought for Lord Rayleigh's famous Terling herd, and he sired no less than thirty-five 2,000-gallon daughters. His sons and daughters generally inherited great conformation

and production qualities and the ability to pass on these qualities to their progeny. The total effect of "Marthus" on the British Friesian breed has undoubtedly been greater than that of any other single animal. The second importation from Holland also had a very considerable effect on the breed, though it had in its favour both the fact that it was working on the improvements already effected by the two previous importations and that, owing to the outbreak of war just three years later, it took place at just the right time. By the time the progeny resulting from this new stock were approaching maturity the war had led to a notable expansion of the breed, as a result of the increased demand for milk.

The shipment from Canada in 1946 was, compared with the previous introductions, a complete out-cross, but it was undertaken much in the nature of an experiment, with udder improvement combined with high milk and fat strains as its main objectives. The results to date have shown that the Canadian importation has been a satisfactory experiment in both gallonage and butterfat content, although the rather different type of animal has not been accepted easily by British Friesian breeders.

The latest importation in 1950 had as its main objects the hastening of further improvement in butterfat percentage and in hind legs. Government permission was given to bring back one hundred animals, but because of the very high standards which the purchasing delegation set themselves, only 70 animals (57 bulls and 13 heifers) arrived at Tilbury. These were sold by auction at Peterborough, and so great was the demand for them that they fetched an average of £3,576.

It is too early yet for the production results of the 1950 importation to be known. The conformation of the young animals already sired by these bulls appears very promising but it will be a few years before the two most important qualifications of production and udders can be assessed. Sixteen of the original bulls (now reduced to thirteen through foot-and-mouth disease) were sent to A.I. stations in Great Britain and, more recently, in the Republic of Ireland. Such has been the pressure for services from these bulls that to date over 21,000 special pedigree inseminations have been performed.

The avowed policy of the Society's Council for many years has been "to raise the overall breed average of butter fat to 3.6 per cent, and, at that level, to obtain the highest milk production possible". Today, the average production of the pedigree breed stands at 9,515 lb. at 3.54 per cent butter fat. The breed holds an impressive list of world records for both milk and butterfat production, including those of the famous cow "Manningford Faith Jan Graceful," who has now given a total of nearly 140 tons of milk, including five official 3,000-gallon yields. In addition, 280 cows of the breed have produced the equivalent of 1,000 lb. butter fat in one lactation, and over 1,160 cows have produced 50 tons or more of milk. An idea of the commercial demand for the breed can be gained by the fact that over 40 per cent of the inseminations performed from dairy and dual-purpose bulls in England and Wales are from sires of this breed.

In addition to its unrivalled qualities for milk and butterfat production, the British Friesian also has the valuable attribute of being able to put on flesh when young or when dry. As a result, many steered calves from the breed are now being reared and fattened, and are most popular with the meat trade. At the last two Smithfield shows the two heaviest animals were British Friesian steers, both under three years old. More important still,

on a weight-for-age basis they compared very favourably with other breeds present, including pure beef breeds.

Such is a brief history of the Friesian breed in Britain. Much has been achieved—but her breeders would be the first to admit that much remains to be done. Long-term policies for further breed improvements are still going on. Much of the success that has come the way of the breed has been due to the skilful development of conformation and butterfat qualities, whilst safeguarding the Friesian cow's unsurpassed natural ability as a milk producer—in which field she has been called, not inaptly, "the foster-mother of mankind".

C. M. Barker,
British Friesian Cattle Society

FARMING AFFAIRS

Higher Quality at Lower Cost The days of "cost plus" production—of more food at any cost—are over. In future we must aim, even more than we do now, at higher quality and at lower costs per gallon, per cwt. or per score. This will be good business both for the farmer and the nation, for it will help to widen the market for home-grown produce at the same time as it makes British agriculture less dependent on the Exchequer. This, broadly speaking, is the burden of the policy proposals the Government announced when it published the new prices after this year's Annual Review.

At the same time the Government said that the national achievement of a net output of 60 per cent above pre-war was still a major objective. But it also warned us that, at present prices, the market could not take much more of our milk, eggs or pigmeat. This poses a tricky question. How can we raise output still further if it is already difficult to find a decent market for what we have to sell from our cows, hens and pigs?

It seems to me that there are three answers. First, the market still requires a lot more beef and also some more good-quality mutton and lamb. Second, one way of increasing our national output—and a very important way at that—is by making better use of our grass and forage crops. For these help to cut down the nation's bill for imported feedingstuffs (we can hardly count the agricultural produce which we import from other lands and use on our farms as part of our own national output). So anything which farmers as a whole can do to make the very best use of their acreage under grass and fodder crops, and to cut down the pounds of concentrate consumed in producing each gallon of milk, pound of pigmeat or dozen eggs will help to raise the national food output. It will also help to provide the third answer. For better use of grass and concentrates will, in most cases, cut production costs and thus help to find a wider market, provided always that we keep a keen eye on quality.

In other words, by going all out for lower costs and higher quality we can do three things at once: (1), increase national output; (2), become less dependent on the Exchequer; (3), create a wider market for what we produce.

Now, how can we set about all this? Well here are some of the ways:

During the period of food shortage, some land inevitably suffered from overcropping, and in such cases thought must be given to the restoration and

maintenance of fertility by the adoption of sound rotations—including, where possible, leys.

The dairy farmer can shorten the winter by about a fortnight at both ends. Winter rations are costly because they must contain high amounts of concentrate. Grass is the cheapest food. The recipe for early and late bite is to have a sward composed largely of a grass that can grow well at low temperatures (New Zealand hybrid ryegrass is the best); to top dress the sward in February and again in August; to rest the sward in winter and late summer.

Quality in bacon depends partly on breed, but also on feeding and management. Feed liberally in the early stages to produce frame and flesh, and restrict the ration in the later stages to prevent excessive fattening.

Fertilizer can be saved by putting it in the right place. For example, 9 cwt. per acre distributed over the ridges before planting potatoes is as good as 13 cwt. sown on the flat before ridging.

There is good evidence that, with a good tilth, suitable fertilizer, the use of seed dressings against insect attack, and effective control of weeds, seed rates for cereals can be reduced by about a quarter below the customary rates. Thinner sowing helps the crop to stand up.

Fewer dairy herd replacements will be needed in future, because milk yields are rising and wastage of cows from disease is being reduced. There is every likelihood of profitable prices for high quality beef stores. The recipe is to use a colour-marking beef bull and to feed the calf fairly liberally during its first year. In other words, good breeding and good feeding.

Greater attention should be paid to strict rationing in the production of milk, pigs and eggs so as to obtain better conversion rates of feed, which on many farms could be much better.

The farm system should be planned so as to keep the labour force productively employed for fifty-two weeks of the year without idle time or excessive peak loads. In addition, attention should be paid to the simplification of working methods so as to make each hour on the job more productive.

To sum up, higher output and good farming still go along, in most cases, with lower costs and higher profits. There are, of course, exceptions. But, by and large—especially if we are not afraid to alter our farming systems to fit the needs of our farms and the market—it will be good business for the farmer and the nation to put the accent on lower costs per gallon, per cwt. or per score, and on higher quality.

J. A. Scott Watson

Farming Cameo: 41. South-West Surrey

The south-western district of Surrey possesses some of the most attractive scenery to be found in the Home Counties, and its beauty spots, such as The Devil's Punchbowl and Newlands Corner, are well known to many Londoners. From the line of the North Downs the district stretches southward to the borders of West Sussex and is bounded on the west by the hills of Hindhead; to the east, there is no natural boundary, the Weald Clay of that area running in a continuous belt through the rest of Surrey and into Kent. The area is of great geological interest; within a distance of ten miles can be found the chalk of the North Downs (of which the Hogs Back forms the western extremity), two entirely separate series of clays—the Gault and the Weald—and a considerable area of Lower Greensand, some of it productive but a large proportion consisting of coarse, sandy heathland of little agricultural value.

Formerly sheep were important in the farm economy of the district, and there are many reminders of this in farm and village names. Today, however, the district is mainly one of small farms, with the dairy cow dominating the scene. The Dairy Shorthorn continues to hold a strong position, although the Channel Island breeds enjoy considerable popularity. The pig population has increased apace since the war, both on the larger farms and on smallholdings of 10 acres or less; the latter, with the help of swill feeding, are almost entirely devoted to pig-keeping. Sows may often be seen running out on the rough scrub and woodland present on many farms. Sheep flocks are not numerous and tend to be confined to the larger farms and to those where the farmer takes personal charge. The few breeding flocks consist of Border Leicester × Cheviots, or Clun ewes crossed with one of the Down rams. It is a practice, however, particularly on certain holdings on the Weald Clay, to take in Kent tegs as "keepers" for the winter months. In common with the rest of the country, there has recently been an increase in egg production on mixed holdings, using the deep-litter and yard systems.

The few large farms of the district are in the vicinity of the Hogs Back and on the more level areas of the Lower Greensand, where cash crops such as wheat, barley, sugar beet and potatoes are grown. Hops are confined to a few farms in the west of the district, linking up with the hop-growing area of Hampshire. Several of the bigger farms find a place for a certain amount of market gardening, and sometimes crops of savoys and carrots are fitted into the farm rotation. However, a few specialist market gardeners are to be found on the better soils of the Lower Greensand; their holdings are large, very intensively cultivated and, for the most part, equipped for irrigation.

Much of the Lower Greensand is steep and uneven, especially in the south-western corner of the district. Maintenance of fertility is an important consideration on these light land farms, and the development of the ley system has been of immeasurable help. Yet despite the grass shortage in midsummer, many farmers have adopted a high standard of grassland management with controlled grazing and silage-making. In view of the very free-draining soil, most of the silage is made in pits.

In direct contrast, the clay soils present their own problems of drainage and cultivation, but with proper treatment they are capable of good crops, particularly of leys and cereals, as the war years proved. Before 1939 the Weald Clay was generally in permanent grass, some of which was very indifferent: today, a high degree of self-sufficiency in home-grown feeding-stuffs has been achieved.

Those who think of Surrey as a county of beautiful scenery for the enjoyment of Londoners at weekends, may completely overlook its farming potentialities and the material contribution which it makes to the nation's food supply. Farmers in the district, coping with a wide variety of land, some of it marginal in character, have no easy task, but they are attaining a level of production which would be regarded as highly creditable in more favoured farming areas.

R. A. Weston,
District Advisory Officer

The Mechanic on the Farm: 2. Working with Metal One of the most frequent tasks in the farm workshop is the cutting and shaping of metal. Hacksaws, cold chisels and files all have to be used, and skill in handling them can save a great deal of hard work. This skill comes from repeatedly performing the operation in the right way. At first, the effort of making sure that the tools are being used correctly will

result in each job taking longer than if it were done in a slapdash fashion, but the finished work will be better and useful training will be acquired.

When a hacksaw is used, almost the whole length of the blade should travel over the work, so that practically every tooth does its fair share of cutting. As little pressure as possible should be applied to the blade, and the best speed is one stroke every second. Faster strokes do not get through the metal any quicker, and they blunt the teeth and sometimes break them. The blade must be drawn up tight, and it must be put into the frame in such a way that the teeth point away from the handle. If a new blade is being used, it should be tightened again after a few strokes, since blades sometimes stretch when first used.

Cold chistels will cut metal cleanly and quickly provided they are held securely and firm, heavy blows are struck with the hammer. The chisel must be kept sharp and its head should never be allowed to become cracked and spread. When the head becomes splayed it is difficult to control the angle of contact between hammer and chisel, and a wrong angle can cause the hammer to slip away from the head of the chisel.

Files should have a wooden handle. Long strokes should be used, and the actual filing should be done in the movement *away* from the body. On the return stroke, the file should be lifted, and not dragged, over the metal. Unless the work being filed is part of some large, heavy piece of machinery, it should be held in a vice to prevent chattering.

An expert is able to keep the filed surfaces flat; the beginner tends to allow the file to move from its straight path at the start and end of the stroke and so he ends up a rounded surface. Control of the direction and movement of the file comes only with practice, and it is one of the marks of the trained worker; nevertheless, this is a job in which self-training can be effective. If a conscious effort is made to keep the file level, the correct hold will soon come automatically.

H. J. Hine

Blotchy Ripening of Tomatoes Tomato growers will long remember 1953, for the large amount of blotchy ripening which appeared on their fruit, especially on those plants growing in steamed soils. The worst feature about this disorder is that it spoils the colour and quality of the early fruit, which is, of course, the most valuable. Mr. W. DYKE of Roydon, Harlow, has contributed the following note, based on some experiments which he made last year.

The season is approaching when blotchy ripening is likely to appear. Growers may therefore like to know of a remedy which I have found most effective, and to adopt it as soon as the disorder appears.

Briefly, blotchy ripening of tomatoes is caused by the plants being forced to absorb too much ammonia as a nitrogen nutrient because there are not sufficient nitrates in the soil.

American research workers on blotchy ripening have found that when tomato fruit ripens in an atmosphere containing no oxygen its colour is yellow. When it ripens in ordinary atmospheric air containing 20 per cent oxygen, the amount of red pigment (lycopene) is not half so much as when the air contains 60 per cent oxygen. This shows the important part which oxygen plays in the development of the red colour.

A developing tomato fruit is green in colour because of the presence of chlorophyll in the cells, and under normal conditions the same changes take

place as occur in the leaves. Under the action of sunlight and the chlorophyll the carbon dioxide from the air and the water from the roots are broken down as sugar, and oxygen is formed in the cells, but as the fruit reaches maturity the green colour disappears and now no oxygen is liberated; this must therefore come from some other source if the lycopene is to be produced.

The nitrogen that the plant needs is absorbed from the soil either as a salt of ammonia or as nitrates. Either of these can combine with the sugar inside the plant to form amides and amino-acids, and the amount of oxygen liberated in the cells depends upon which of these forms is used. The ammonia contains no oxygen, but in every 62 parts of a nitrate there are 48 parts of oxygen, and from that it is easy to see which source of nitrogen will produce the best coloured fruits.

In the ash of the tomato fruit there is 63 per cent potash. Dr. Owen (formerly of Cheshunt) found much more potash in good coloured fruit than in blotchy. In a small experiment carried out last year in July, August and September with some late plants, I found that in those fed with sulphate of ammonia there was blotchy ripening, but those fed with nitrate of potash coloured perfectly. That is a clear indication of the causes of the disorder, but another important factor now comes in; the nitrate-fed plants only carried 3¼ lb. of fruit per plant (stopped at three trusses) but the ammonia-fed produced 8½ lb., (60 tons to the acre) on a 3-foot plant. This experiment shows for the first time the relative part played by ammonia and potash. The plant needs the ammonia for producing a big, vigorous plant with large trusses, but also the nitrate of potash to prevent blotchy ripening. It looks as if the proportion should be 2 parts of ammonia to 1 of nitrate.

When blotchy ripening is seen to be developing, apply 4 oz. nitrate of potash per square yard and lightly water in. Follow this with a mixed fertilizer of equal parts nitrate of potash, sulphate of ammonia, and superphosphate, at the rate of 2 oz. per square yard once a week. If the plants are in fruiting pots, use the same mixture at the rate of a level teaspoonful per gallon every time the plants are watered. No fertilizer is equal to this to get good coloured, quality fruit and a very heavy crop.

Avoid using organics for top feeding, for they and overwatering cause the destruction of the nitrates in the soil.

W. Dyke

BOOK REVIEWS

The Use of Lime in British Agriculture. H. W. GARDNER and H. V. GARNER. Spon. 26s.

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It is rarely that one comes across a book written primarily for such a large range of readers as *The Use of Lime in British Agriculture*. It is intended, say the authors, for farmers of the present and future and for those who come in contact with them, either as teachers, advisers or lime suppliers. It comes at an opportune time when the need for lime is being more widely recognized, and it is based on knowledge and experience gained, not only from their own efforts but from many other sources during a period of some thirty years. Inevitably the interests of such a wide public are bound to differ, and consequently some sections may not necessarily find all that they would wish in a book of this size. However, many of the statements in it have a direct practical application.

The historical section is concise and interesting, and the authors have gone to some considerable trouble to outline the chemical background of the function of lime in the soil. They are to be congratulated on their efforts to give in simple words an explanation of *p*H. The farmer will probably find in the experimental data given in this book examples which can be applied almost directly to his own holding.

In so far as lime in animal nutrition is concerned, it is stressed that lime is important in the feeding of livestock, and in this section information not easily obtained by the breeder and feeder is presented in a readily available form.

In all, Gardner and Garner have assembled a good deal of information which should find its place in any agricultural library. One criticism that must, however, be made is that the book is slightly biased towards lime produced from chalk.

G.L.G.

Rural Estate Management (2nd Edition). R. C. WALMSLEY. Estates Gazette. 37s. 6d.

Five years after its first appearance, Mr. Walmsley has deemed it necessary to prepare a second edition of this book. The first edition found general favour with owners, land agents and especially students, and was a remarkable achievement accepted as being the nearest thing to an encyclopedia on rural estate management yet produced. In short, it was a thoroughly good book. But the second edition is vastly better in all respects.

It is a pointed comment on the times between the two editions that no less than twenty-one statutes affecting land management to some degree were passed in these five years, and to some degree have affected about one-third of the contents. The new edition is a valuable presentation of necessary knowledge and indicates a trend in the conception of land management as a subject; to treat the whole subject adequately means that it must be continually broken down, and the necessity to deal fully with its parts means more or longer books. It is safe to prophesy that in years to come this work must appear in further editions, if not in more than one volume.

In his preface the author says that the book is intended primarily for those connected with land management; but it would do untold good if placed in the hands of those who are unaware of the value to the nation and the agricultural industry of the landlord-and-tenant system of land tenure in this country, or of the immense responsibility of those who operate the system with such striking success. The book is a perfect statement of case for the need for a really well-informed body of professionally qualified land agents, and an impressive demonstration of the breadth of knowledge which they must possess. The time has long passed when the land agent fulfilled his duty by acting as a kind of aide-de-camp to his landowner. In these times rural land should be managed on sound business lines, and the attributes of a successful business man are precisely those of the good landowner and good land agent. That being so, the chapters entitled "The Land Agent's Scrap-Book" and "Old Hints to Young Land Agents," although no doubt containing much simple wisdom, occupy nearly fifty valuable pages which I cannot help wishing were devoted to technical matter. This apart, the arrangement of the new edition is excellent and the removal of the bibliography to appendices is particularly commendable. The index, as in the first edition, still stands up to test.

The success of a book of this kind must depend primarily on whether its substance is really authoritative, and one might have expected that when so many different contributors were involved there would be a variation in the quality of treatment of subjects. This, however, is not so, and the brilliance of certain chapters does not outshine the soundness which is sustained throughout the work. It is to be hoped that the new edition has the success it undoubtedly deserves.

R.G.A.L.

The Efficiency of Farm Animals in the Conversion of Feedingstuffs to Food for Man. I. LEITCH and W. GODDEN. Technical Communication No. 14, Commonwealth Bureau of Animal Nutrition. Commonwealth Agricultural Bureaux. 5s.

During the Second World War, when it had become clear that the available supplies of feedingstuffs were insufficient to meet the full needs of all the country's livestock, the question of the efficiency with which different farm animals convert feedingstuffs into food for man became a matter of importance, and attempts were made by a number of nutritional workers to provide the solution of this rather intricate problem. Of these attempts, that by Dr. Leitch and Mr. Godden had special merit, not only on account of the comprehensiveness of their treatment of the subject, but also because of the close and sound reasoning on which their final conclusions were based. The results of their inquiry were published in 1941 in the form of a technical communication from the Imperial (now Commonwealth) Bureau of Animal Nutrition. The volume under review is substantially a reissue of this publication, with an additional section by Dr. Leitch, in which the significance of the earlier findings is further discussed.

The efficiencies with which the following classes of livestock transform the energy and protein equivalent in their diets into the energy and protein in the food products for which they are fed are worked out on a quantitative basis: dairy cattle (winter and summer milk production), beef cattle (fed for prime beef or for baby beef), bacon pigs and porkers, ewes and fat lambs, laying hens and table poultry. Space forbids a detailed summary of the findings, but it may be mentioned that dairy cows and pigs emerge very satisfactorily from the comparisons.

The general reader who may not be accustomed to thinking in terms of calories, or who is not conversant with such conceptions as protein equivalent and gross digestible energy, may find the reading of the text and the understanding of the tabular matter rather "heavy going," but he will have no difficulty in grasping the practical significance of the main conclusions. Readers who are interested in the scientific aspects of animal feeding, however, should certainly keep this volume by them for reference. *H.E.W.*

Mushrooms and Toadstools. JOHN RAMSBOTTOM. Collins. 30s.

The publication of this latest book in the New Naturalist series has been eagerly awaited by professional and amateur mycologists alike. It is a unique work in our mycological literature, as it treats fungi as living organisms and not merely as taxonomic units. The author has devoted whole chapters to "Growth", "Spore Production and Spore Characters", "Sex", "Fairy Rings", "Luminosity", and various kinds of habitat.

As the editors state in their preface, this is a more technical volume than most of the others in the series, as is inevitable when writing of fungi. It is not, however, intended as a handbook for the identification of toadstools. Dr. Ramsbottom has assembled a vast number of facts in this one book and has presented them in very readable form, and in so doing he has dispelled a large number of legends and fantasies surrounding the fungi. Nevertheless, he may be thought to have become unduly abstruse in places, especially in the two chapters on "Poisonous and Edible Fungi".

He has also selected a title which does not do justice to the contents, for the terms mushroom and toadstool, although rather loosely used within certain limits by the general public, are restricted to those fungi with an umbrella-shaped cap bearing gills on the undersurface (or sometimes pores) and the whole supported on a more or less distinct stalk. But this book is far from being confined to these fungi, and, indeed, the reader will find abundant mention of many of the larger fungi, including the Ascomycetes. The main criterion for deciding which groups of fungi should be mentioned seems to have been size. It is surprising then to find a whole chapter devoted to penicillin and its production from microscopic species of *Penicillium*. Considerable space is also given to *Claviceps purpurea*, which can hardly qualify on the basis of size. There is also evidence of hurried proof reading, which has resulted in a failure to detect a number of spelling errors in the text.

In any book on toadstools it is essential that the illustrations should be of a very high standard. This is necessary because many species are much alike macroscopically, and slight differences in the colour of the cap, and especially of the gills, may be of very great importance in identification. The coloured plates in this volume include some really excellent and very pleasing studies—of which *Amanitopsis fulva*, *Hygrophorus puniceus* and *Boletus edulis* deserve special mention—but unfortunately not all the coloured illustrations attain this high quality, and some are extremely poor, even misleading, especially Plates 8a, 14b, 26b, and 38b. On the other hand, the black and white half-tones are without exception of a high standard.

All the illustrations would have been improved by the addition of a scale. Its absence is often more than a little confusing. For example, in one of the composite colour plates, four Discomycetes are shown on different scales, which makes *Peziza rutilans* appear to be a very robust fungus much larger than *P. aurantia*, whereas the latter is always very much larger.

Despite its faults, *Mushrooms and Toadstools* will provide many hours of pleasant, and indeed entertaining, reading for nature-lovers as well as mycologists, and will undoubtedly stimulate all who read it to go out into the woods and fields to make observations for themselves.

D.A.R.

Breeds of Domestic Animals *(Husdjursraserna)*. Edited by PROFESSOR IVAR JOHANSSON. LTs Förlag, Stockholm, Grøndahl and Søn, Oslo. 48s.

Copiously illustrated and containing contributions by several authors, this book, which is written in Swedish, is intended primarily for teachers and breeders throughout Scandinavia. Nevertheless, it contains many things of interest to us in Britain.

In the early chapters Johansson of Sweden gives an account of the zoological position, domestication and improvement of the different species of farm animals. Notable in this section is a striking illustration of the skeleton of a wild boar compared with that of an improved English pig. Jesperson of Denmark writes on the evolution and types of horses, beginning with a general account of the different breeds in Europe, including British, and then dealing in more detail with the Scandinavian breeds. Weights and measurements are given. Korkman of Sweden follows the same pattern in regard to cattle, including Zebu types, and includes tables showing average body weights with fat and milk production for most breeds. Sheep and goats are similarly dealt with by Berge of Norway.

In an interesting section on pigs, Johansson emphasizes and illustrates the effect of nutrition on form. He gives details of the Swedish litter testing stations and the breed improvements effected in his country, as well as discussing the different pig breeds. Finally, there are sections by Venge of Sweden on rabbits and fur-bearing animals, by Høie of Norway on poultry, and one by Westermarck of Finland on the numbers and distribution of farm animals throughout the world. The latter is well illustrated with maps.

J.H.

Introductory Mycology. C. J. ALEXOPOULOS. Chapman and Hall. 56s.

There is considerable scope in the field of mycology for an elementary text-book, and it was with this end in view that Professor Alexopoulos set about writing *Introductory Mycology*. The result is a thorough, and fairly detailed, survey of the morphology and classification of fungi, with a chapter each on bacteria (including the Actinomycetales) and slime moulds. Technical terms are freely introduced but are carefully explained the first time they are used, and there is a full glossary at the end of the book.

The most original feature of the work is the series of diagrams depicting the life cycle of a large number of species. They have been very neatly and clearly drawn by Mrs. Sun Huang Sung, and will be found invaluable by the student. This artist was in fact responsible for all the 187 illustrations appearing in the book. All have been reproduced very well, and the printing of the text, too, is plain and clear. Doubtless these virtues, and the fact that it was printed in America, are responsible for the very high price.

A.B.

Cost Accountancy in Agriculture. L. W. BOLTON. Gee and Co., London. 17s. 6d.

In this little book—the text covers only fifty-six pages, with a further twenty pages or so devoted to an appendix—Mr. Bolton has outlined a method of accounting which would enable the farmer not only to keep a systematic check on the use of labour, foodstuffs and other raw materials, machinery, and so on, but also to break down the total yearly profit into its component parts. It is, however, nothing more than an outline, and many of the recognized problems in cost accounting on the farm are either very briefly touched upon or not mentioned at all. For example, in the specimen productive accounts in the appendix, an item is included for "interest on capital" but no attempt is made to show either how the total yearly capital should be computed or how that capital should be apportioned over the livestock and crop accounts. The book should give the accountant a clear idea of the accounting problems involved but it does not give the farmer much guidance about how the cost accounts could be used as an aid to more efficient management. This is perhaps understandable, because the proper interpretation and application of accounting data calls for a knowledge of the technical aspects of farming which the accountant is not likely to possess.

Mr. Bolton disarms a good deal of criticism by emphasizing that "farm cost accounts must be essentially personal" and that both the methods and the examples given by him "are not likely to be applicable as they stand to any other farm". It is because of this that one would have welcomed more thorough discussion of the problems that are common to cost accounting on almost every farm.

J.W.

The Scilly Isles. (The Regional Books Series). C. C. VYVYAN. Robert Hale. 18s.

An aura of romance still clings to the Scilly Isles. If Cornish and Breton legend is to be believed, they are the remaining vestige of that land of Lyonesse now submerged below the grey waters of the Atlantic, the memorial of a fair and fertile kingdom where King Arthur had his capital in "many tower'd Camelot". Lady Vyvyan is not unaware of this gilding quality, but to her credit she firmly subordinates it, for the most part, to an essentially practical approach. If tradition, heredity and geographical isolation have played their part in the fashioning of Scillonian character, it is equally true that economic circumstance has compelled the activities of the islanders to the opportune. Fishing, smuggling, the bounty of wrecks, shipbuilding, kelp-burning—all have served in greater or lesser measure to provide for these island communities until today, when the present prosperity rests upon the export of early flowers to the mainland and upon catering for the tourist trade of holiday visitors.

Seen from the air, St. Mary's, the largest of the islands, the most popular and, it must be admitted, the most sophisticated, is aptly described by Lady Vyvyan as "a chessboard set down in the sea". The small bulb gardens, laid out in narrow strips and bordered by evergreen hedges, abound everywhere. Yet that is a superficial impression; one has only to wander about the island to apprehend the wealth of variety contained in this fair microcosm.

Tresco, to the north-west, the place of residence of the ruling family since Augustus Smith founded a new dynasty of Governors in 1834, is a world unto itself. The Abbey garden is world famous for its exotic beauty and commemorates the diligence of generations of men who have contributed plants and seeds from all over the world.

Flanking Tresco to the east, lie St. Martins and the Eastern Isles, and to the west, Bryher and Samson. In the extreme south-west, St. Agnes and the Western Rocks stand sentinel against the Atlantic. Lady Vyvyan describes them all with infinite care and no small degree of literary skill. Their diversity, yet their oneness, is recalled time and again as she takes her reader from gull-infested headlands, scrambling through gorse and bracken and over boulders, down to the white beaches and the sheltered coves below. Here, briefly, is the legacy of Lyonesse.

S.R.O'H.

Dartmoor. L. A. HARVEY AND D. ST. LEGER-GORDON. Collins. 25s.

Over most of our modern landscape, the broken and defeated forces of the Kingdom of the Wild can at best wage a petty guerilla warfare against the occupying garrisons of the Kingdom of Man. Rabbits breed under the hedgerows, rats lurk in the sewers, weeds grow in the fields and gardens; but neither they nor their allies seriously challenge human domination. On Dartmoor, however, the old order continues. Man has explored the Moor, he has modified much of its ecology, he raids it seasonally in large numbers, he has even settled there. But he has not conquered it. Dartmoor remains one of the few areas in southern England where, at some periods of the year, so slight an accident as a sprained ankle can cost a man his life.

This study of Dartmoor is the latest of the *New Naturalist* series designed to "interest the general reader in the wild life of Britain by recapturing the inquiring spirit of the old naturalists," and it worthily continues the traditions of its predecessors. In approach, it is thorough and systematic, leading the reader via the geology, climate and physical characteristics of the moor to its flora and fauna and finally to its human history and present society. In argument, it is detailed without losing continuity and factual without losing charm, the cruder type of tabulated information being thoughtfully relegated to appendices. In quality, it owes much to the intense sympathy of the authors with the matter in hand, and they speak of the animals, birds and plants of Dartmoor as familiar friends, not as raw material for the naturalist. Clearly, Professor Harvey and Mr. St. Leger-Gordon know Dartmoor; they do not merely know *about* it. There is wet and cold and personal delight as well as scientific study behind their book.

The story they tell also illustrates in very striking fashion that major problem of our day—the fierce pressure of the English community on the English soil. Even Dartmoor, the most desolate area south of the Midlands, does not escape varied public demand, and Professor Harvey carefully weighs the conflicting claims on the 200 square miles of this National Park of forestry, defence, mineral-working, sheep farming, recreation and the conservation of wild life. Here inevitably he speaks as an individual. Equally inevitably many readers will regard him as biased—"bias" being defined, of course, as the possession of a scale of values different from one's own. But by more absolute standards of criticism he seriously understates the potential agricultural case (and in so doing lessens the weight of his testimony) by ignoring the 1,600 acre farm of Princetown Prison. Surely a farm, even a presumably uneconomic farm, which lies above the 1,200 feet contour yet carries 200 acres of ploughland and produces milk and bacon as well as beef and mutton, should receive proper treatment in a book whose terms of reference include "not only wild nature but man's place in it".

This, however, is the only weakness in a wise, detailed and superbly illustrated book which should appeal alike to the holiday-maker, the naturalist, the scholar and the rural economist or administrator.

N.H.

Report on Farming, 1952. Farm Economics Branch Report No. 40, School of Agriculture, Cambridge. 4s.

A summary of the accounts and production of some three hundred farms in the Eastern Counties over a nine-year period can easily be very dull reading unless careful thought is given to its presentation. The Farm Economics Branch of the Cambridge School of Agriculture is therefore to be congratulated on its clever use of charts to bring out the essential facts and thus retain the reader's interest.

In the first two chapters of this report, farm capital, gross output, gross charges (or costs) and, most important of all, net returns for 1952, are compared with those for the previous year. But although these clearly- and carefully-written sections have many lessons for

all concerned with agriculture, it is the last chapter on efficiency standards that adds something new. And it is from this section that the individual farmer should gain the most benefit.

To many farmers, income tax and farm accounts are almost synonymous, and too few realize that farm accounts, when properly used, can be valuable guides to better management and, by simple progression, to bigger profits. With a few easy calculations (the methods are clearly set out in an appendix) this report shows how any farmer can test the efficiency of his farm operations. For this reason alone, the study should make its appeal far beyond the confines of East Anglia. Cost and price relationships constantly change, and farm organization must be adjusted accordingly if profits are to be maintained. The vital questions are where and how to make these changes, and the few pages on labour and livestock efficiency should do much to help the farmer solve these problems.

For those farmers who are already making full use of their farm accounts, this report offers some more valuable comparisons. For those who have not yet learned the part accounts can play in the management of their farms, here is a booklet to show them the way and to provide some good advice.

G.A.H.

The Measurement of Plant Climate. SIDNEY A. SEARLE. Chichester Press. 4s. 6d.

In this small, well-produced book Mr. Searle deals in a capable fashion with that very important, but comparatively neglected, meteorological element—soil temperature. He gives us a fairly clear explanation in simple terms of the part played by the earth's surface in the exchange of heat, and produces maps of average soil temperature (at a depth of one foot under level grass) over the British Isles. It is true that the maps bear a striking resemblance to the average air temperature maps. This is only to be expected. But the earth temperatures are not only easier for an individual farmer or grower to measure; they also give a better integration of current conditions and thus are a clearer seasonal indicator.

The corrections used for time of observation and for altitude may not be strictly accurate, but they are obviously of the right order. The author was perhaps lucky in being able to compare two such widely different autumns and winters as 1951–52 and 1952–53, and future seasons may provide less clear-cut deductions; but it is certain that the important significance of soil temperature needs far more emphasis than it has received in the past, and this book can be recommended to scientifically-minded readers as a very interesting contribution to the problem.

L.P.S.

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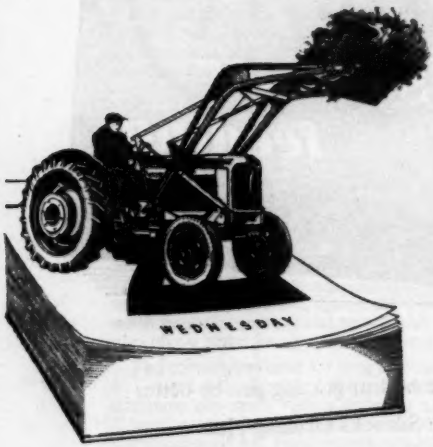

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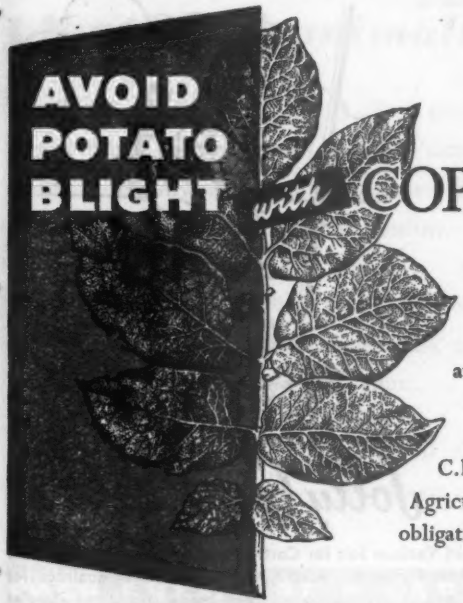

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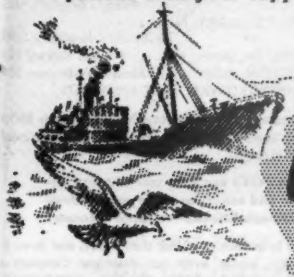

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Good Hay

A 'late' top-dressing for increased protein may also be applied to grass that will be cut for hay.

Every year more farmers are using tripods—a method that can produce high-quality hay, even when weather conditions are difficult.

Cereals

Production costs are all-important these days, and one of the best means of reducing the cost *per ton* of growing cereals is to increase the yield per acre by top-dressing with nitrogen fertilizer. Top-dressing is particularly important with the modern strong-straw varieties—such as Atle, Cappelle Desprez and Hybrid 46—which, although capable of out-yielding many of the older varieties, can do so only when given adequate nitrogen.

These new wheats generally need a total of 3 cwt. Sulphate of Ammonia or 4 cwt. 'Nitro-Chalk' per acre, if they are to yield their maximum. Applied as late as possible, though before the wheels of the distributor can cause real damage—usually towards the middle of May—nitrogen goes mainly to fill the ear. Its use increases the 1,000-grain weight and can help to improve the sample.

Nitrogen for weight and quality

BOTH GRASS AND CEREALS benefit from a 'late' top-dressing of Sulphate of Ammonia or 'Nitro-Chalk', applied in May.

On grass, nitrogen applied about a fortnight before cutting for silage or hay can raise the protein content of the herbage by one-fifth—besides helping to produce a quicker-growing and heavier aftermath.

On wheat, a May top-dressing increases the yield and, since it has little effect on the growth of straw, it does not increase the risk of lodging. It can also help to improve the sample of grain.

Don't miss the opportunity for 'late' top-dressing this month—it will give you a big return for a modest outlay.

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